

Manual of Operation and Instruction

Model 4141 Gyratory Compactor

NOTE

Before using the Model 4141 Gyratory Compactor, carefully read this manual. It is especially important to understand the *Safety Warnings* on page 1–2. Keep this manual in a safe place that is always easily accessible during the use of the Model 4141.



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HOW TO USE THIS MANUAL

Congratulations on the purchase of the **Model 4141 Gyratory Compactor**.

The **Model 4141 Manual of Operation and Instruction** contains information on safely using this unit. Also included in this manual are safety warnings, basic parameter setup, system troubleshooting, and general maintenance.

*Do not attempt to operate the Model 4141 before reading this manual and the safety warnings posted on the unit. Troxler stresses that *the user is solely responsible* for ensuring the safe use of the Model 4141. Neither the manufacturer, its subsidiary, representatives, or distributors can assume responsibility for any mishaps, damage, or personal injury that may occur from failure to observe the safety warnings in this manual and posted on the unit.*

CONVENTIONS USED IN THIS MANUAL

Throughout this manual, symbols and special formatting are used to reveal the purpose of the text as follows:

WARNING

Indicates conditions or procedures that, if not followed correctly, may cause personal injury.

CAUTION

Indicates conditions or procedures that, if not followed correctly, may cause equipment damage.

NOTE

Indicates important information that must be read to ensure proper operation.

⟨KEY⟩ Angle brackets and a different typestyle indicate a key or character (number or letter) to press on the compactor keypad. For example, “Press **⟨START⟩**” means to press the key labeled *START*.

DISPLAY A different typestyle is used in text to indicate information or messages displayed on the compactor.

DISPLAY – Typestyle and shading used to simulate the 4141 display

- ◆ Diamonds indicate a list of things needed (such as equipment) or things to know.
- ✓ Check marks indicate the performance of an action. With lists of check marks, follow the instructions in the order of the check marks.
- ▶ Triangles indicate that more than one option is available. Carefully select the option that applies.

EU DECLARATION OF CONFORMITY

Application of Council EMC Directive 89/336/EEC, 93/42/EEC, and Low Voltage Directive 73/23/EEC (as amended by 93/68/EEC) and Machinery Directive 93/87/EEC.

Standards to which Conformity is Declared:

EN 61010-1 (1993) and A2 (1995)
EN 50082-2 (1995)
EN 50081-2 (1993)
EN 292-1 (1991)
EN 292-2 (1991) and A1 (1995)

Manufacturer: Troxler Electronic Laboratories, Inc.
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Apparatus: Model 4141 Gyratory Asphalt Compactor

Year of Manufacture: 2002

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WARRANTY

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ATTENTION COMPACTOR OWNER

*This unit contains functions that require an ACCESS CODE.
This code must be entered before using these functions.*

The ACCESS CODE for this unit is:

5389

This page should be removed if the access code is not to be distributed to other parties or users of this unit.

NOTES

CHAPTER 1

INTRODUCTION TO THE MODEL 4141

This chapter provides an introduction to the Model 4141 Gyratory Compactor, as well as information on operating the compactor safely. This chapter also includes a list of parts and accessories, and instructions for unpacking and inspecting the system.

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SAFETY WARNINGS

The Troxler Model 4141 is a safe, durable gyratory compactor. Troxler cannot anticipate every example of improper or unauthorized use of this unit that may lead to malfunction or accident. Thus, if a particular use is *not specifically mentioned* in this manual as authorized, then consult Troxler about the alternate use. Otherwise, it is assumed that the use is unauthorized and improper.

To ensure minimal operator risk, Troxler recommends the following safety precautions:

- ◆ Wear safety glasses when preparing an asphalt specimen.
- ◆ Always wear heat-resistant gloves when handling any hot substance.
- ◆ When moving the mold, grasp it firmly on either side under the upper flange.
- ◆ Remove all objects, except the mold and asphalt specimen, from the specimen chamber before pressing the manual compaction keys or the automatic compaction key.
- ◆ Do not operate the compactor without the guards (shrouds) in place and the chamber door closed.
- ◆ Do not wear loose clothing or jewelry when operating the compactor.
- ◆ Keep hands away from the gyratory compactor when the unit is in motion.
- ◆ With the shrouds off, the gyratory compactor poses an electrical hazard. Unplug the gyratory compactor before removing the shrouds.
- ◆ When operating the gyratory compactor with the casters in place, ensure that the leveling feet are fully extended (down).

CAUTIONS AND WARNINGS



Left Side of Compactor (Identification of Interconnects)

- ◆ 9-pin RS-232C serial interface for connecting the compactor to a computer
- ◆ 25-pin parallel interface for connecting the compactor to a printer
- ◆ 12 V dc connection to power the Model 3191 True Mold Angle (TMA) Device
- ◆ Stereo plug receptacle to enable the TMA device to bypass the compactor's door interlock.

NOTE

The TMA device must be mounted on the Model 4141 Gyratory Compactor before connecting the TMA device's stereo plug into the compactor.

INTRODUCTION

The engineering properties of an asphalt mix relate directly to the compaction method. Thus, the method of specimen compaction is crucial to creating asphalt specimens that behave similar to asphalt used in construction and in obtaining meaningful test results.

Studies show that gyratory compacted asphalt specimens possess engineering properties similar to those achieved under actual paving conditions.

The Model 4141 Gyratory Compactor (shown in Figure 1–1 and Figure 1–2) provides safe, reliable gyratory compaction of asphalt specimens at a compaction pressure of 600 kPa, and a 1.25° angle of gyration. The Model 4141 provides significant improvements over other gyratory compactors in operator safety, machine durability, ease of operation and maintenance, noise levels, heat output, and energy consumption.

For operator safety, all rotating parts are covered and cannot be physically accessed during compaction. Interlocks prevent the gyratory compactor from operating with the top panel improperly positioned or with the specimen chamber door open. The red **EMERGENCY** safety button in the lower right corner of the control panel stops all moving parts.

WARNING

The Model 4141 Gyratory Compactor should not be operated with the chamber door or any panels removed.

The Model 4141 requires little maintenance. To reduce the effects of gyration on moving parts, the gyratory compactor requires regular cleaning and lubrication. For a schedule of machine maintenance, refer to Appendix A.

CAUTION

Do not use a degreasing cleaner or glass cleaner to clean the clear chamber door. To prevent damage to the door surface, use a mild detergent only.

The Model 4141 allows the operator to produce 150-mm or 100-mm diameter asphalt specimens. The operator specifies the number of gyrations (or end specimen height) at a fixed angle of gyration of 1.25°. When using the *Automatic* compaction mode, the operator may also choose to automatically send the gyration-versus-height data to a computer or a printer. The unit also allows manual printing of the last twelve compacted specimens. All output is in SI units as described in American Society of Testing and Materials (ASTM) SI10, *Standard for Use of the International System of Units (SI): The Modern Metric System*.

Before compaction, the operator heats both the hot-mix asphalt and the mold/puck assembly. The operator then loads the mold with a predetermined amount of hot-mix asphalt and places it in the compaction chamber for gyratory compaction.

For ease of operation, the Model 4141 provides a fully automatic method of compaction. In *Automatic* compaction mode, the Model 4141 compacts an asphalt specimen at the touch of a single key. The compactor also offers *Manual Control* functions that enable the operator to manually exercise each phase of specimen compaction.

NOTE

The *Manual Control* functions are intended for use only during maintenance or servicing of the compactor, or to recover from failures encountered in a compaction cycle while in *Automatic* mode. The *Manual Control* functions should not be used to compact asphalt.

After compacting the asphalt, the operator removes the asphalt specimen from the mold using the integral extruder. Once removed from the mold, the specimen is ready for testing.

NOTE

Do not attempt to operate the Model 4141 before reading this manual and the safety warnings posted on the unit. Troxler stresses that the operator is solely responsible for ensuring the safe use of the Model 4141. Neither the manufacturer, its subsidiary, distributors, or representatives can assume responsibility for any mishaps, damage, or personal injury which may occur from failure to observe the safety warnings in this manual and posted on the unit.

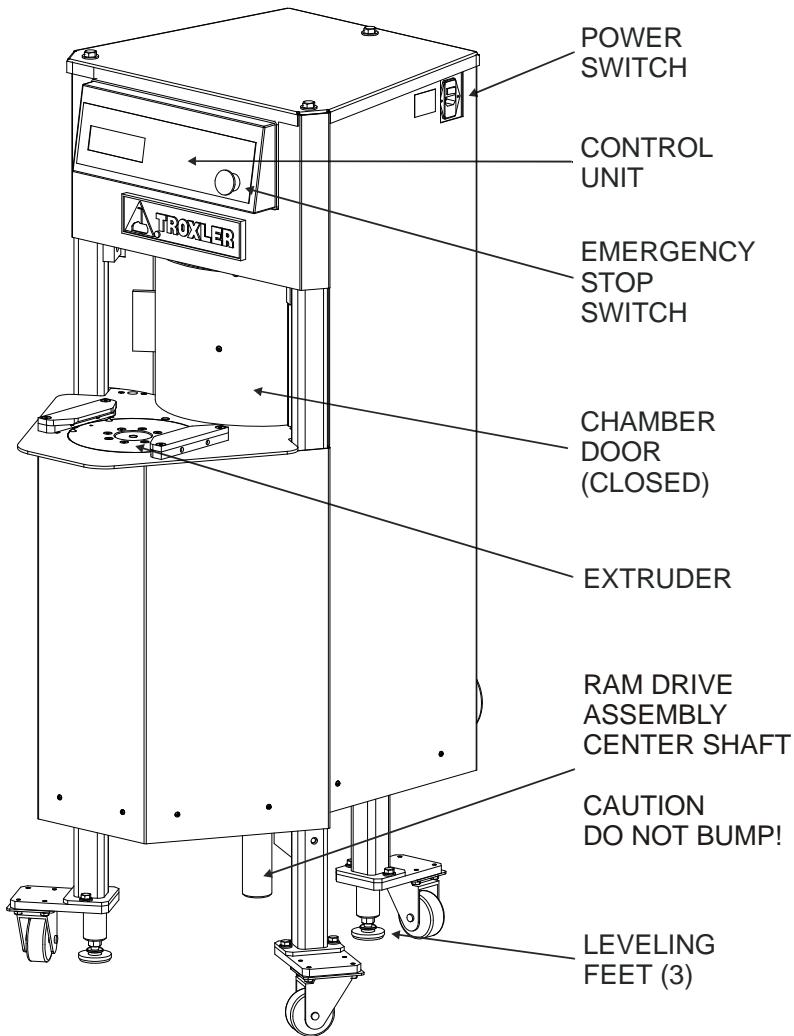


Figure 1–1. Model 4141 Gyratory Compactor (Front View)

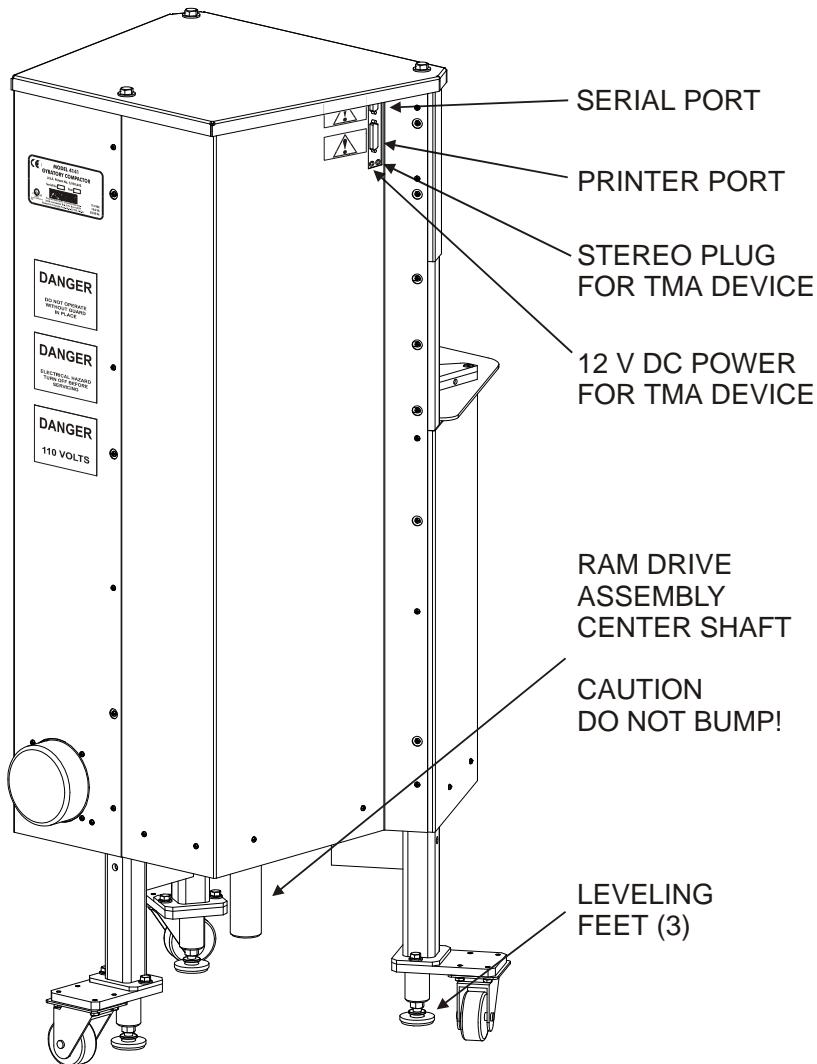


Figure 1–2. Model 4141 Gyratory Compactor (Back View)

PARTS AND ACCESSORIES

The Model 4141 includes the electrical and mechanical parts required to continuously compact hot-mix asphalt. Using Figure 1–1 and Figure 1–2, locate and identify the following parts:

- ◆ The **power switch** is located on the upper right side of the compactor.
- ◆ The **control unit** contains the control electronics for the gyratory compactor. It provides the operator interface with the Model 4141 and the interface for optional equipment.
- ◆ The **mold** (not shown), with a puck inserted, receives the asphalt for making specimens. A second puck is placed on top of the asphalt. The molds and pucks are manufactured from hardened steel to resist wear and pitting. The inside diameter of the mold is 150 mm. A 100-mm diameter mold is also available.
- ◆ The **ram head** (not shown) moves upward into the mold to compact the asphalt specimen. The face of the ram head is also made of hardened steel to resist wear and pitting. The ram head size is 150 mm. A 100-mm ram head is available for use with 100-mm molds.
- ◆ The **extruder** removes the compacted asphalt specimen from the mold.
- ◆ The **dot matrix printer** (not shown) allows the operator to print data.
- ◆ The **parallel printer cable** (not shown) connects the compactor to a printer.
- ◆ The **serial cable** (not shown) connects the compactor to a serial device, such as a computer.
- ◆ The **height calibration standard** (not shown), in conjunction with the upper and lower pucks, is used in calibrating the specimen height.
- ◆ The **Model 4141 Manual of Operation and Instruction** (not shown) provides the operating instructions for the compactor.
- ◆ The **specimen papers** (not shown) prevent the asphalt specimen from sticking to the pucks.
- ◆ The optional **Pressure Verification Kit** (not shown) allows the operator to verify the pressure calibration. The pressure is initially calibrated at the factory.

UNPACKING AND INSPECTION

Upon receipt of the Model 4141 Gyratory Compactor from the factory, a complete inspection and inventory should be performed.

Check to see that the following are included:

- ◆ Model 4141 Gyratory Compactor
- ◆ Power cord
- ◆ Dot matrix printer
- ◆ Parallel printer cable
- ◆ Serial cable
- ◆ Height calibration standard
- ◆ Specimen papers (500 per package)
- ◆ Lubricant (1 can) and application brush
- ◆ Eyebolts and hex nuts (3 each)
- ◆ Manual of Operation and Instruction
- ◆ GyroPave™ for Windows XP® software on CD-ROM and Manual of Operation and Instruction

Inspect each part for damage that may have occurred during shipment. If any parts or accessories appear damaged, notify the carrier and your Troxler representative immediately.

Refer to Chapter 2 for assembly instructions.

NOTES

CHAPTER 2

GETTING STARTED AND PRINTING

This chapter describes how to get started using the Model 4141 Gyratory Compactor. This information includes instructions for assembling the compactor, a brief description of the control unit, and instructions for turning the compactor on, setting it up, and printing.

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UNPACKING AND ASSEMBLY

WARNING

The Model 4141 weighs 265 kg (585 lb). To prevent personal injury or equipment damage, exercise care while unpacking the unit.

CAUTION

Before removing the Model 4141 Gyratory Compactor from its shipping pallet or rolling it from one place to another, adjust the leveling feet (see Figure 2-1) until they are fully retracted up into their mounting posts. Rolling the compactor with the leveling feet down increases the risk of tipping the unit over.

When moving the compactor, do not bump the center shaft of the ram drive assembly (the red shaft that extends below the compactor body, as shown in Figure 2-1). Bending or flexing the shaft can damage the ram drive assembly.

NOTE

Troxler recommends that all packaging material be saved. It may be reused to pack the compactor for shipping.

REMOVING THE SHIPPING CARTON

To remove the shipping carton from the top of the unit:

- ✓ Cut each side of the carton approximately 2 inches above the pallet.
- ✓ Lift the carton up and off the unit.

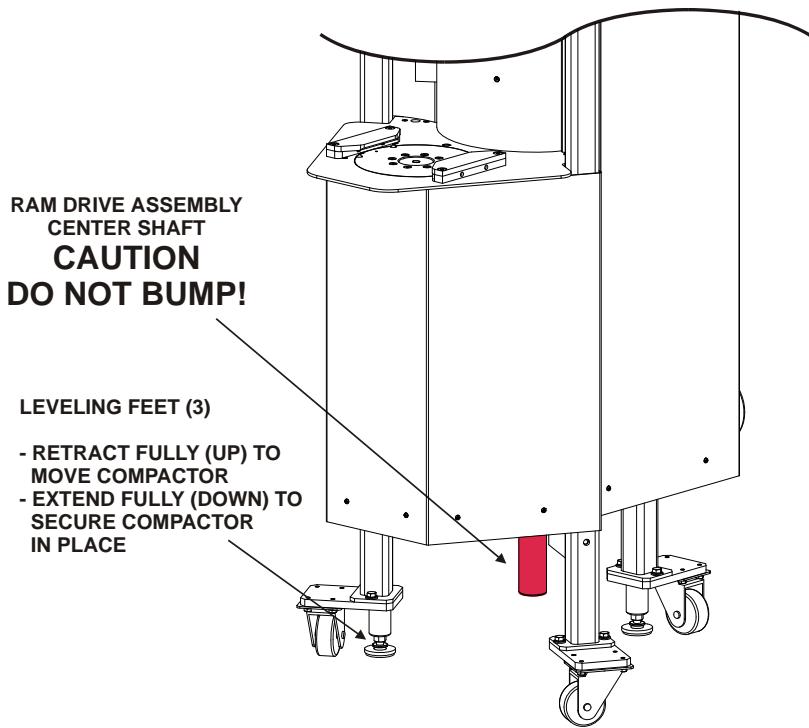


Figure 2–1. Ram Drive Assembly Center Shaft and Leveling Feet

REMOVING THE COMPACTOR FROM THE PALLET

Recommended Method (Using Forklift or Hoist)

Troxler recommends using a forklift or hoist to lift the compactor from the pallet. To remove the compactor from the pallet:

- ✓ Adjust the three leveling feet (see Figure 2–1) until they are fully retracted (up) into their mounting posts.
- ✓ Using a 3/4-inch wrench, remove the three hex-head bolts from the top panel of the compactor and install the three 1 1/2-13 eyebolts included with the compactor accessories.
- ✓ Attach the center point of a sling or chain to the eyebolt at the rear corner of the compactor. Attach one end of the sling or chain to each of the other corners.

- ✓ Position the forklift or hoist over the center of the compactor and attach the two side lengths of the sling or chain to the forklift or hoist.
- ✓ The compactor is secured to the pallet by three metal brackets. Remove the twelve nuts that bind the brackets to the pallet.
- ✓ Carefully lift the compactor from the pallet, ensuring that the compactor remains relatively level.
- ✓ Slide the pallet out from under the compactor.
- ✓ Gently lower the compactor to the floor.
- ✓ Remove the eyebolts from the top panel and replace the hex-head bolts.

Alternate Method (Manual)

If a forklift or hoist is not available, the compactor may be lifted from the pallet manually as follows:

- ✓ Using a screwdriver, remove the 2 × 2-inch strips that border the pallet.
- ✓ The compactor is secured to the pallet by three metal brackets. Remove the twelve nuts that bind the brackets to the pallet.
- ✓ Adjust the three leveling feet (see Figure 2–1) until they are fully retracted (up) into their mounting posts.

WARNING

To prevent personal injury or equipment damage, do not tip the compactor while lifting it from the pallet.

- ✓ Using three or four persons, carefully roll the compactor to the edge of the pallet and lift to the floor.

CAUTION

When moving the compactor, do not bump the center shaft of the ram drive assembly (the red shaft that extends below the compactor body, as shown in Figure 2–1). Bending or flexing the shaft can damage the ram drive assembly.

REMOVING THE CASTER/FOOT ASSEMBLIES

The compactor is mounted on casters and is designed to be portable. If desired, the compactor may be permanently fixed in place by removing the caster/foot assemblies and bolting the frame to the floor. To mount the compactor:

- ✓ Place the unit in its permanent site.
- ✓ Remove the caster/foot assemblies as follows:
 - ✓ Using a 3/4-inch wrench, remove the three hex-head bolts from the top panel of the compactor and install the three 1/2-13 eyebolts included with the compactor accessories.
 - ✓ Attach the center point of a sling or chain to the eyebolt at the rear corner of the compactor. Attach one end of the sling or chain to each of the other corners.
 - ✓ Position the forklift or hoist over the center of the compactor and attach the two side lengths of the sling or chain to the forklift or hoist.
 - ✓ Carefully lift the compactor, ensuring that the compactor remains relatively level.
 - ✓ Using a 9/16-inch wrench, remove the two 3/8-16 bolts that secure each caster/foot assembly to the compactor frame.
 - ✓ Lower the compactor to the floor.
- ✓ Bolt the compactor to the floor using the mounting holes in the base of the compactor frame.

ASSEMBLY

- ✓ Plug the compactor into a standard 115 V ac outlet.
- ✓ If using the compactor with a printer, connect the printer to the printer port using the parallel printer cable provided. As shown in Figure 1-2, the printer port is located on the left side of the compactor, in the upper right corner of the side panel. See the printer *Operating Instructions* for further details on using the printer supplied by Troxler.
- ✓ If using the compactor with a computer, use the serial cable provided to connect the computer to the serial port. As shown in Figure 1-2, the serial port is located on the left side of the compactor, in the upper right corner of the side panel.

CONTROL UNIT

Figure 2–2 shows the layout of the Model 4141 control unit keypad. Table 2–1 lists the functions for each key and button.

Table 2–1. Control Unit Keys and Button

KEY	FUNCTION
⟨EMERGENCY⟩	Stops all machine movement. Rotate the button clockwise to release it and return the control unit to the MACHINE IDLE display.
⟨START⟩	Press to begin automatic compaction of asphalt specimen.
⟨STOP⟩	During gyration, aborts the compaction cycle. In <i>Manual Control</i> mode, pauses the ram.
⟨SETUP⟩	Press to access the <i>Setup</i> options. These options include setting the number of gyrations or target specimen height, selecting the data output port and mode, and setting the time of day and date.
⟨ESC⟩	Returns the control unit to the MACHINE IDLE screen without storing or updating data.
⟨YES⟩	Press to respond Yes to Yes/No questions.
⟨NO/CE⟩	Press to respond No to Yes/No questions, or to enter a negative (–) sign. Also clears an incorrect entry and allows for re-entry.
⟨↑⟩, ⟨↓⟩	Press to scroll through menu options or to view screens.
⟨0⟩ .. ⟨9⟩	Press to enter numeric values, or to access menu options.
⟨.⟩	Press to enter decimal point.
⟨ENTER⟩	Press after entering data.

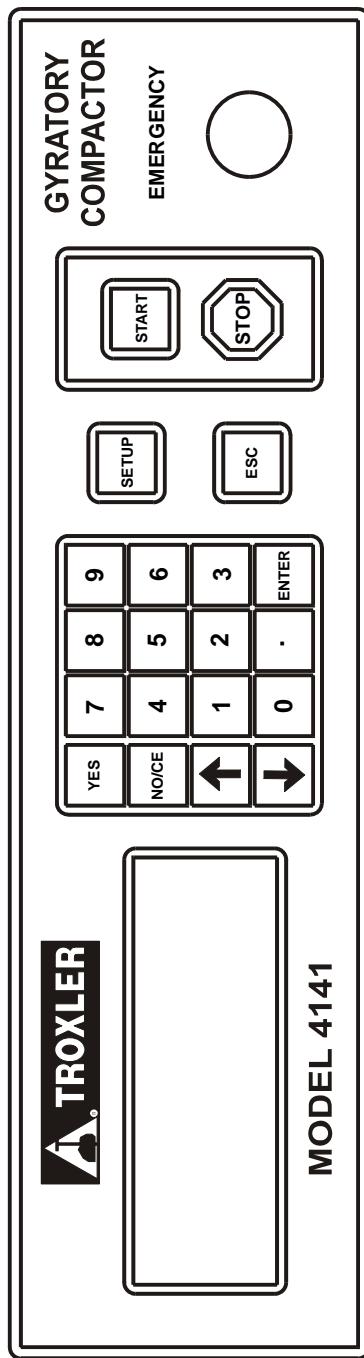


Figure 2–2. Model 4141 Control Unit Keypad

TURNING THE SYSTEM ON

NOTE

Control unit screens in this manual are intended as examples only. Values on your displays may differ slightly from those in this manual.

The power switch is located on the right side of the compactor, near the upper right corner (see Figure 1–1 on page 1–6). After switching the gyratory compactor on, the control unit displays the model number, model name, and software version number as shown below.

**Troxler Model 4141
Gyratory Compactor
Version: x.xx
Press ENTER**

After the operator presses **<ENTER>**, the compactor moves the ram to its home position. The control unit then displays the **MACHINE IDLE** screen shown below. The operator may then access the compactor software.

**MACHINE IDLE
#Gyr: xx Mold:150mm
Min Height: 50.0
Out: None**

SETUP

Before compacting an asphalt specimen in the Model 4141 Gyratory Compactor, the operator may define a number of options. The operator may compact the specimen for a specified number of gyrations, or to a target specimen height. Data can be downloaded or printed either automatically during compaction or manually from memory. The Model 4141 can transmit the specimen height, compaction pressure, or angle for each gyration to a printer, computer, or both. A graphic printing option is also available. The operator can also set the time in a twelve or a twenty-four hour format and date in a month/day/year or a day/month/year format.

The unit must be in the *Idle* mode to access the *Setup* options. From the **MACHINE IDLE** screen, press **<SETUP>** on the control unit keypad. The first *Setup* menu screen displays options for setting the number of gyrations, the target specimen height, and the output mode as shown:

```
Press # to Select ↑
1-Gyrate to # Gyr.
2-Gyrate to Height
3-Select Output
```

To scroll through the other *Setup* options, use the arrow keys. The control unit displays the following two screens:

```
Press # to Select ↓
4-Calibration
5-Clock/Calendar
6-Manual Control
```

```
Press # to Select ↑
7-Select Diameter
8-Review Constants
9-Pressure/Angle
```

To select a *Setup* option, press the number key that corresponds to the option number. The following sections describe each *Setup* option.

NUMBER OF GYRATIONS

The Model 4141 provides the operator with two modes of gyration. The operator may either compact the specimen for a set number of gyrations or to a specified target height. The default mode of gyration is the number of gyrations.

To enter the number of gyrations for a compaction cycle, press **⟨1⟩**. The screen is:



The total number of gyrations is the number of times the compactor rotates the specimen during compaction. Use the number keys to enter the desired number of gyrations (from 1 to 300) and press **⟨ENTER⟩**. The display returns to the **MACHINE IDLE** screen, with the selected number of gyrations displayed as **# Gyr**.

NOTE

When a total number of gyrations is entered, the minimum height of the specimen is set to a default value of 50 mm.

TARGET SPECIMEN HEIGHT

The operator can also compact the asphalt specimen until it reaches a specified target height of 50 to 200 mm. The default (and minimum) specimen height is 50 mm. The final specimen height may vary slightly from the value entered. Differences in specimen height are mix-dependent. If the height is not acceptable, modify the height set on the unit.

NOTE

When a target specimen height is entered, the number of gyrations is set to a default value of 270. If the compactor reaches 270 gyrations before the specimen is compacted to the target height, the compactor will stop gyration.

To set a target specimen height, press **⟨2⟩** from the *Setup* menu. The screen is:



Use the number keys to enter the target specimen height (from 50 to 200 mm) and press **⟨ENTER⟩**. The display returns to the **MACHINE IDLE** screen with the target specimen height displayed as **Min. Height** and the number of gyrations set to 270.

SELECT OUTPUT

The Model 4141 provides several options for automatically or manually outputting or printing data. The height-versus-gyration data can be formatted either in *Height Only* format for use with Federal Highway Administration (FHWA) software, or in *Table* format for use with Troxler's GyroPave for Windows XP software. The compactor can also manually download the data in *%Gmm* format, where the results are *%Gmm* versus the number of gyrations (*N*) based on the volumetric properties entered by the operator. Data may be output to the printer port, serial port, or both.

NOTE

Before outputting data to a printer or computer, ensure that the Model 4141 is properly connected to the output device.

Manual Output

The *Output Data Set* function allows the operator to manually download data stored in the control unit's memory. The control unit stores up to twelve *data sets* containing information on the last twelve compaction cycles. Each data set includes the sample height (in mm) versus number of gyrations (*N*) for a gyrated specimen, the date and time of compaction, the compaction pressure, and the number of revolutions. Printed table format data sets also include a blank for the Sample ID.

NOTE

The operator can also manually print out pressure or angle information for the most recent compaction cycle. This option is described later in this chapter.

To access the *Output Data Set* function, press **(3)** at the *Setup* menu screen (see page 2-9). The display is:

```
Press # To Select
1-Output Data Set
2-Enable Auto Out
3-Disable Auto Out
```

Press **⟨1⟩** to access the *Output Data Set* function. The display is:

```
Select Output Type
1-Height Only
2-Table
3-% Gmm
```

Select the output type by pressing the corresponding number key. If you select *Height Only* or *Table*, then see the description below. If you select *%Gmm*, then see the *Percent Gmm Output* section on the following page.

HEIGHT ONLY OR TABLE OUTPUT. If *Height Only* or *Table* is selected from the **Select Output Type** screen, the control unit prompts the operator to select the output port (either the printer port, serial port, or both) as shown:

```
Select Output Port
1-Printer
2-Serial
3-Both
```

To send the data to the printer port, press **⟨1⟩**; to send the data to the serial port, press **⟨2⟩**; to send the data to both the printer and serial ports, press **⟨3⟩**.

The control unit then displays the date and time of the last twelve data sets stored in memory locations 1 through 12:

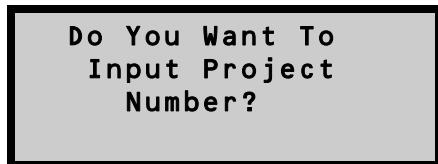
```
↑
1 mm/dd/yyyy hh:mmA
2 mm/dd/yyyy hh:mmP
3 mm/dd/yyyy hh:mmA
```

NOTE

Because the Model 4141 overwrites the oldest data set during compaction, the most-recent data set may not be listed first. Data sets stored using software earlier than version 2.02 will show only a two-digit year.

Use the \uparrow and \downarrow keys to scroll through the data sets. Using the numerical keys, select the data set to be output, and press **$\langle\text{ENTER}\rangle$** . The control unit sends the data to the selected port(s), and then returns to the **MACHINE IDLE** screen.

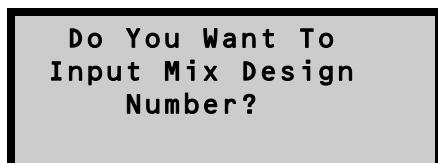
PERCENT GMM OUTPUT. If $\% Gmm$ is selected from the **Select Output Type** screen, the control unit prompts for a project number as shown:



Do You Want To
Input Project
Number?

To continue without entering a project number, press **$\langle\text{NO/CE}\rangle$** . To enter a project number, press **$\langle\text{YES}\rangle$** . To enter numbers, use the number keys. To enter alpha characters, scroll using the arrow keys to display the desired letter and press **$\langle\text{ENTER}\rangle$** . After entering the project number, press **$\langle\text{ENTER}\rangle$** .

The control unit prompts for a mix design number as shown:



Do You Want To
Input Mix Design
Number?

To continue without entering a mix design number, press **$\langle\text{NO/CE}\rangle$** . To enter a mix design number, press **$\langle\text{YES}\rangle$** . To enter numbers, use the number keys. To enter alpha characters, scroll using the arrow keys and accept the letter by pressing **$\langle\text{ENTER}\rangle$** . After entering the mix design number, press **$\langle\text{ENTER}\rangle$** .

The control unit prompts for the number of samples to average. Enter the number of samples (1–12) to average using the number keys, and press **ENTER**.

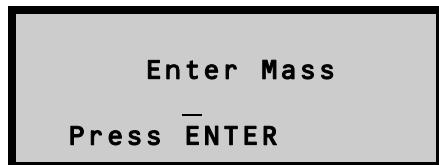


The control unit prompts for the *G_{mm}* value of the mixture, as shown below. The *G_{mm}* value is the theoretical maximum specific gravity.

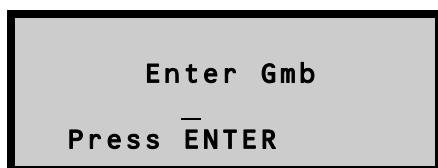


Enter the *G_{mm}* value using the number keys, then press **ENTER**.

The control unit then displays the date and time of the last twelve data sets stored in memory locations 1 through 12. Select a data set by pressing the number key that corresponds to the number of the memory location. The control unit prompts for the mass of the first sample as shown below. Enter the mass of the specimen using the number keys, then press **ENTER**.



The control unit then prompts for the *Gmb* value for the first specimen as shown below. The *Gmb* value is the bulk specific gravity of the compacted specimen. Using the number keys, enter the *Gmb* value for the sample, then press **ENTER**.



If the operator chooses to average more than one data set, the control unit again displays the date and time of the last twelve data sets. Repeat the selection for each data set to be included in the average. Select each data set and enter the mass and actual *Gmb* for each set.

NOTE

All data sets included in the average calculation should have the same number of gyrations. If not, the control unit uses the *smallest* number of gyrations for calculating the average.

After the mass and *Gmb* for each data set have been entered, the control unit displays the output options:



The control unit can print or download a table of the *%Gmm* versus *N* data (see Figure 2-3). It can also print a graph (see Figure 2-4) and table for this data. Select the output type by pressing the number key that corresponds to the desired format.

Note that the time and date in the header of each printout refers to the time the data was printed. The time and date given above the sample data in the tables refers to the time and date that the sample was completed.

 TROXLER 4141 Gyratory Compactor
 SN: 150
 Date: 4/08/2009 Time: 12:15PM

 GYRATORY COMPACTOR SAMPLE INFORMATION

Project Number _____
 Maximum Specific Gravity, Gmm 2.604
 Gyrations: N initial = 8 N Design = 109 N Maximum = 174
 Mix Design Number _____

Actual Asphalt Content _____
 Vertical Consolidation Pressure 600 KPa

Sample Weight 5075g. Gmb 2.550 Date: 4/08/2009 Time: 3:45P

Sample 1	Height	Gmb(est)	Gmb(corr)	%Gmm
N ini	128.1	2.242	2.263	86.9
N des	115.2	2.493	2.517	96.7
N max	113.7	2.526	2.550	97.9

Sample Weight 5021g. Gmb 2.548 Date: 4/08/2009 Time: 4:15P

Sample 2	Height	Gmb(est)	Gmb(corr)	%Gmm
N ini	125.1	2.271	2.283	87.7
N des	113.5	2.503	2.517	96.7
N max	112.1	2.534	2.548	97.8

Sample Weight 4986g. Gmb 2.553 Date: 4/08/2009 Time: 4:45P

Sample 3	Height	Gmb(est)	Gmb(corr)	%Gmm
N ini	124.0	2.275	2.287	87.8
N des	112.4	2.510	2.523	96.9
N max	111.1	2.539	2.553	98.0

Average Sample Weight 5027g. Gmb 2.550

Average	Height	Gmb(est)	Gmb(corr)	%Gmm
N ini	125.7	2.263	2.278	87.5
N des	113.7	2.502	2.519	96.7
N max	112.3	2.533	2.550	97.9

Figure 2–3. Sample %Gmm Table

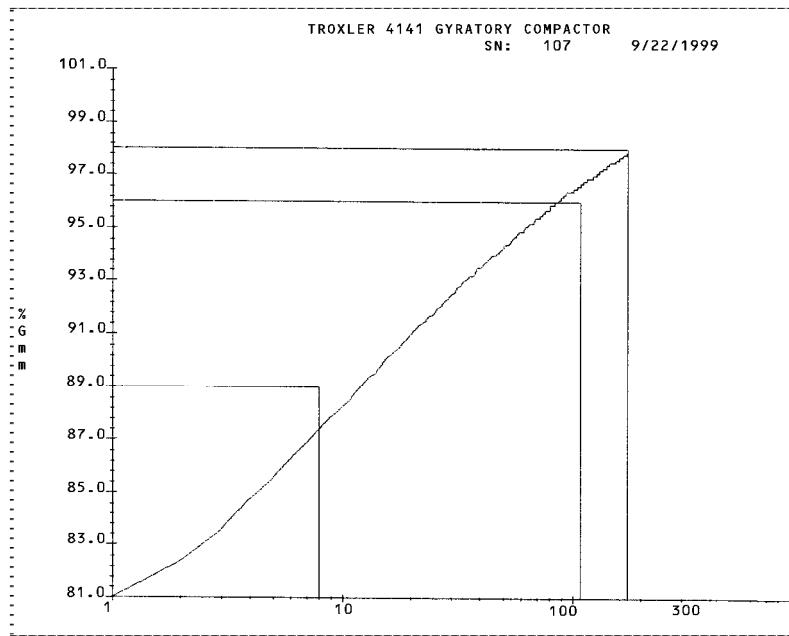


Figure 2–4. Sample %Gmm Graph

If the operator selects the *Print Table* option, the control unit requests the output port (printer port, serial port, or both). Select the output port by pressing the corresponding number key. The control unit outputs the table and returns to the **Output %Gmm** screen.

If the operator selects the *Graph & Table* option, the control unit prints the graph and table to the printer port. After printing, the control unit returns to the **Output %Gmm** screen.

The $\%Gmm$ versus N graph (see Figure 2–4) has a logarithmic x-axis. The graph includes three reference lines: N_{ini} , N_{design} , and N_{max} . The default positions for the reference lines are set to FHWA Superpave™ (Superior Performing Asphalt Pavements) volumetric mix design property values of 89%Gmm, 96%Gmm, and 98%Gmm, respectively. To change the positions for the reference lines, press **(SETUP)**. Select the *Review Constants* option by pressing **(8)**. Follow the control unit prompts to enter the new %Gmm references.

Auto Out

The operator can choose to automatically download gyration-versus-height data during compaction. The data can be formatted either in *Height Only* format for use with FHWA software, or in *Table* format for use with GyroPave for Windows XP software. The Model 4141 can download data to the printer port, serial port, or both.

NOTE

The Auto Out feature is not available in *Manual Control* mode.

The control unit displays the *Auto Out* status in the **MACHINE IDLE** screen. The bottom line of the screen displays **Out: Prn.** for the printer, **Out: Ser.** for the serial port, **Out: Both** for both, or **Out: None** if the *Auto Out* feature is disabled.

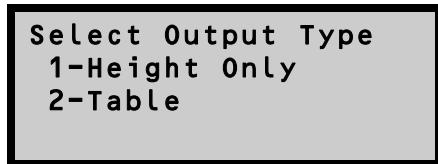
To change the status, output type, or output port of the *Auto Out* feature, press **〈SETUP〉**. The display is as follows:

```
Press # to Select ↑
1-Gyrate to # Gyr.
2-Gyrate to Height
3-Select Output
```

Press **〈3〉** to access the *Select Output* function. The display is:

```
Press # To Select
1-Output Data Set
2-Enable Auto Out
3-Disable Auto Out
```

Press **⟨2⟩** to enable the *Auto Out* function or **⟨3⟩** to disable it. If the operator enables the *Auto Out* function, the display is:



```
Select Output Type
1-Height Only
2-Table
```

Press the number key corresponding to the desired output type. The control unit then requests the output port:



```
Select Output Port
1-Printer
2-Serial
3-Both
```

Press the number key that corresponds to the desired output port. The control unit returns to the **MACHINE IDLE** screen.

CALIBRATION

Chapter 3 describes the calibration functions available from the compactor's *Setup* menu.

CLOCK/CALENDAR

The compactor stores the height-versus-gyration data for the last twelve specimens using the date and time. With the *Table* or *%Gmm* output options, the time and date of compaction are downloaded with the data. The data for the last twelve specimens is stored with the time and date of compaction for use with the *Output* feature.

To access the *Clock/Calendar* feature, press **⟨5⟩** at the *Setup* menu (see page 2–9). The control unit displays the following:

```
NO/CE to set
Time: hh:mmAM
Date: mm/dd/yyyy
ESC To Exit
```

To set the time and date, press **⟨NO/CE⟩**. The control unit displays the following:

```
NO/CE to set
Time: _ :mmAM
Date: mm/dd/yyyy
Fill each space
```

NOTE

The hour, minutes, month, and day must each be entered as two-digit numerals, with leading zeroes as required. The year must be entered as a four-digit numeral. For example, to set the time to 7:06, press **⟨0⟩⟨7⟩⟨0⟩⟨6⟩**. Similarly, to set the date to April 8, 2009, press **⟨0⟩⟨4⟩⟨0⟩⟨8⟩⟨2⟩⟨0⟩⟨0⟩⟨9⟩**.

If the time and date are entered incorrectly, they cannot be corrected until the control unit is reset. To reset the unit, turn the compactor power off, and then back on.

MANUAL CONTROL

The *Manual Control* functions are described on page 4–12.

NOTE

The *Manual Control* functions are intended for use only during maintenance or servicing of the compactor, or to recover from failures encountered in a compaction cycle while in *Automatic* mode. The *Manual Control* functions should not be used to compact asphalt.

SELECT DIAMETER

CAUTION

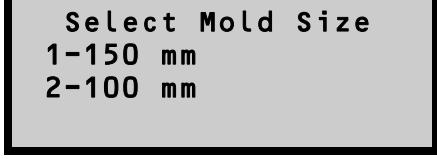
Ensure that the mold diameter selected in the compactor software is correct for the mold size in use before compacting a specimen. Failure to select the proper mold diameter in the software can cause erroneous compaction results or equipment damage.

NOTE

To ensure proper compactor operation, calibrate the compaction pressure and specimen height as described in Chapter 3 after changing the mold size.

The compactor allows the user to produce 150-mm or 100-mm diameter asphalt specimens. The *Select Diameter* option enables the operator to configure the compactor software for the diameter of the mold in use.

To access the *Select Diameter* option, press **⟨7⟩** at *Setup* menu (see page 2–9). The control unit displays the following:



Select Mold Size
1-150 mm
2-100 mm

Press **⟨1⟩** to set the mold diameter to 150 mm; press **⟨2⟩** to set the diameter to 100 mm. The control unit returns to the **MACHINE IDLE** screen with the selected mold size displayed.

REVIEW CONSTANTS

The *Review Constants* feature enables the operator to review and manually change a number of constant values stored in the compactor. These constants include the current reference values for calculating $\%Gmm$, the calibration values for pressure and rotation, the service hours, the unit serial number, and the system output.

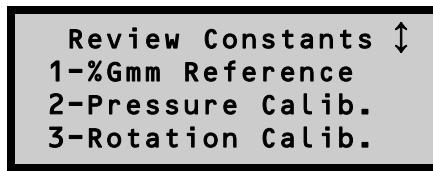
NOTE

The $\%Gmm$ reference values, as well as the calibration values for pressure, rotation, and angle, are critical to the proper operation of the compactor. Many of these values are calculated and stored in the control unit during calibration of the compactor (see Chapter 3). These values should not be changed manually, except by qualified service personnel.

NOTE

The *Access Code* is required to manually change any of the constant values accessed through the Review Constants feature.

To access the *Review Constants* feature, press **⟨8⟩** at the *Setup* menu (see page 2–9). The control unit displays the following:



Review Constants ↑
1-%Gmm Reference
2-Pressure Calib.
3-Rotation Calib.

To scroll through the other *Review Constants* options, use the arrow keys to display the following:

Review Constants ↓
4-Initial Speed
5-Angle Slope
6-True Angle Value

Review Constants ↓
7-Service Hours
8-Serial Number
9-System Output

Percent Gmm Reference

To review the *%Gmm* reference values (*Nini*, *Ndesign*, and *Nmax*), press **⟨1⟩**. The control unit displays the following:

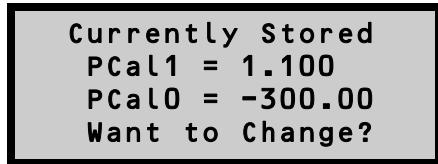
Currently Stored
Nini= Ndes= Nmax=
89.0 96.0 98.0
Want to Change?

To exit without changing the *%Gmm* reference values, press **⟨NO/CE⟩**. The control unit returns to the **MACHINE IDLE** display.

To manually change the *%Gmm* reference values, press **⟨YES⟩**. The control unit prompts the operator for the Access Code. This code is for authorized personnel only, and must be entered to change the value. For assistance with the code, contact the nearest Troxler representative.

Pressure Calibration

To review the pressure calibration values, press **⟨2⟩** from the **Review Constants** display. The control unit displays the following:



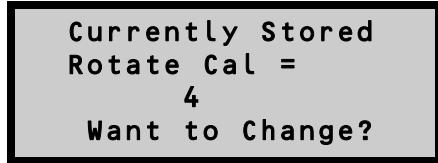
Currently Stored
PCal1 = 1.100
PCal0 = -300.00
Want to Change?

To exit without changing the pressure calibration values, press **⟨NO/CE⟩**. The control unit returns to the **MACHINE IDLE** display.

To manually change the pressure calibration values, press **⟨YES⟩**. The control unit prompts the operator for the Access Code. This code is for authorized personnel only, and must be entered to change the value. For assistance with the code, contact the nearest Troxler representative.

Rotation Calibration

To review the rotation calibration value, press **⟨3⟩** from the **Review Constants** display. The control unit displays the following:



Currently Stored
Rotate Cal =
4
Want to Change?

To exit without changing the rotation calibration value, press **⟨NO/CE⟩**. The control unit returns to the **MACHINE IDLE** display.

To manually change the rotation calibration value, press **⟨YES⟩**. The control unit prompts the operator for the Access Code. This code is for authorized personnel only, and must be entered to change the value. For assistance with the code, contact the nearest Troxler representative.

Initial Speed

To review the initial speed value, press **⟨4⟩** from the **Review Constants** display. The control unit displays the following:



Currently Stored
Init Fast Rotate =
1200
Want to Change?

To exit without changing the initial speed value, press **⟨NO/CE⟩**. The control unit returns to the **MACHINE IDLE** display.

To manually change the initial speed value, press **⟨YES⟩**. The control unit prompts the operator for the Access Code. This code is for authorized personnel only, and must be entered to change the value. For assistance with the code, contact the nearest Troxler representative.

Angle Slope

NOTE

The *Angle Slope* selection should not be used. This value is set at the factory and should not be changed.

True Angle Value

NOTE

The *True Angle Value* selection should not be used. This value is set at the factory and should not be changed.

Service Hours

The Model 4141 records the total number of hours of operation, and the hours since its last service. To review the service hours, press **⟨7⟩** from the **Review Constants** display. The control unit displays the following:

```
Total hours = xxxx
Hours since last
Serviced = xxxx
Want to Change?
```

To exit without changing the service hours, press **⟨NO/CE⟩**. The control unit returns to the **MACHINE IDLE** display.

To manually change the service hours, press **⟨YES⟩**. The control unit prompts the operator for the Access Code. This code is for authorized personnel only, and must be entered to change the value. For assistance with the code, contact the nearest Troxler representative.

Serial Number

The serial number of the Model 4141 is stored in the control unit. If the unit's memory becomes corrupt, or if the control unit is replaced, the correct serial number must be entered into the control unit. To review the serial number stored in the control unit, press **⟨8⟩** from the **Review Constants** display. The control unit displays the following:

```
Serial Number
xxxxx
Currently Stored
Want to Change?
```

To exit without changing the serial number, press **⟨NO/CE⟩**. The control unit returns to the **MACHINE IDLE** display.

To manually change the serial number, press **<YES>**. The control unit prompts the operator for the Access Code. This code is for authorized personnel only, and must be entered to change the value. For assistance with the code, contact the nearest Troxler representative.

System Output

The *System Output* option enables the operator to send a listing of the constant values to a printer, computer, or both. A sample printout is shown in Figure 2–5. To print the constant values, press **<7>** from the **Review Constants** display. The control unit displays the following:



```
Select Output Port
1-Printer
2-Serial
3-Both
```

Press **<1>** to send the system output to the printer port; press **<2>** to send the system output to the serial port; press **<3>** to send the system output to both. Note that no Access Code is required for the *System Output* feature. The control unit returns to the **MACHINE IDLE** display.

4141 GYRATORY SYSTEM OUTPUT

Serial Number: 55 Time: 1:03PM Date: 4/08/2009

(Mo/Day/Yr, time of change)

PRESSURE CALIBRATION: 4/08/2009 10:57
PCall = 1.140 PCalo = -311.76 LoopScale = 0.4126
System Pressure: 595
Calib. Pressure: 596

HEIGHT CALIBRATION: 4/08/2009 12:15
Home: 201.12
Standard: 114.03
Measured: 114.49

ANGLE CALIBRATION: 4/08/2009 2:32
Slope = 2200 True Angle = 1.25

ROTATION CALIBRATION: 4/08/2009 3:13
RotateCal = 4 Initial Speed = 1456 RPM = 29.97

Total Hours of Operation = 52.5

Hours Since Last Service = 2.5

Mo/Day/Yr of Last Service = 4/08/2008

Figure 2–5. Sample System Output Printout

PRESSURE/ANGLE

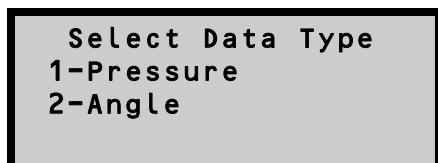
The *Pressure/Angle* feature enables the operator to manually print the pressure or angle at each gyration for the most recent specimen. The data is printed in tabular format.

To access the Pressure/Angle feature, press **⟨9⟩** from the *Setup* menu (see page 2–9). The control unit displays the following:



```
    Select Output Port
    1-Printer
    2-Serial
    3-Both
```

Press **⟨1⟩** to send the system output to the printer port; press **⟨2⟩** to send the system output to the serial port; press **⟨3⟩** to send the system output to both. The control unit displays the following:



```
    Select Data Type
    1-Pressure
    2-Angle
```

Press **⟨1⟩** to send pressure data to the selected port(s); press **⟨2⟩** to send angle data. The control unit returns to the **MACHINE IDLE** display.

CHAPTER 3

CALIBRATION AND ADJUSTMENTS

This chapter discusses calibration and verification of compaction parameters for the Model 4141 Gyratory Compactor.

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CALIBRATION SCHEDULE

The Troxler Model 4141 Gyratory Compactor is calibrated at the factory, and requires no initial calibration upon receipt.

Troxler recommends the following verification/calibration schedule for the Model 4141. Note that the height, pressure, rotation speed, and angle parameters may be verified at any time. Calibration is not required if parameters are verified to be within limits. If calibrating the compaction pressure and specimen height, calibrate the pressure first. Then, calibrate the height.

PRESSURE VERIFICATION/CALIBRATION

See page 3–6 for details on pressure verification and calibration.

NOTE

After calibrating the compaction pressure, calibrate the specimen height.

- ✓ Verify the compaction pressure every 80 hours of operation or every month. If the pressure is not within specifications, recalibrate the pressure.

HEIGHT VERIFICATION/CALIBRATION

See page 3–10 for details on height verification and calibration.

- ✓ Verify the specimen height daily. If the height is not within specifications, recalibrate the height.
- ✓ Calibrate the specimen height after calibrating the compaction pressure.

ROTATION SPEED VERIFICATION/CALIBRATION

See page 3–13 for details on rotation speed verification and calibration.

- ✓ Verify the rotation speed every 80 hours of operation; every month; or after replacing the gyration motor, gearbox, or control unit.
- ✓ Calibrate the rotation speed if the turntable appears to rotate at speeds other than 30 rpm.

ANGLE VERIFICATION

See page 3–14 for details on verifying the angle of gyration.

The angle of gyration is continuously monitored and shown in the lower right corner of the display during gyration. For verification, the operator may print the angle versus gyration data following each compaction cycle (see Chapter 2).

- ✓ Verify the angle every 80 hours of operation or every month.
- ✓ Remove the electronic angle indicator probe yearly for calibration (see page 3–14). Contact your Troxler representative for instructions on returning the probe for calibration.

CALIBRATING AND VERIFYING PARAMETERS

WARNING

To prevent personal injury or equipment damage, before operating the Model 4141 Gyratory Compactor, the operator should become familiar with the safety warnings on page 1-2.

The Model 4141 allows for simple verification and calibration of the compaction pressure, the specimen height, and the speed of rotation.

NOTE

The verification and calibration processes are similar: in each process, the compactor measures system operating parameters. However, during verification, the compactor merely compares the measured values to those stored in the system memory; the stored values are not changed. During calibration, the compactor replaces the stored values with the measured values.

To verify or calibrate the pressure, height, or speed of rotation, press **〈SETUP〉** from the **MACHINE IDLE** screen. The first *Setup* menu screen is displayed:

```
Press # to Select ↑
1-Gyrate to # Gyr.
2-Gyrate to Height
3-Select Output
```

Press **〈4〉** to access the *Calibration* functions. The control unit displays:

```
Select Mode:
1-Calibrate
2-Verify
3-Verify + Printout
```

Select Mode:
4-Default Values

CAUTION

The *Default Values* selection overwrites system calibration values stored in memory with factory default values. This function is to be used only by qualified Troxler service personnel.

Press **⟨1⟩** to calibrate parameters, **⟨2⟩** to verify parameters, or **⟨3⟩** to verify parameters and print out the results automatically. The *Verify + Printout* selection can be used to maintain a log of verification results.

If *Calibrate* is selected, the control unit displays:

Select Calibration ↑
1-Pressure
2-Height
3-Rotation

Select Calibration ↑
4-Angle of Gyration

NOTE

The *Angle of Gyration* selection is to be used only by qualified Troxler service personnel.

If *Verify* or *Verify + Printout* is selected, the control unit displays:

Verify Calibration
1-Pressure
2-Height
3-Rotation

PRESSURE

The Pressure Verification Kit includes all the equipment needed to calibrate and/or verify the compaction pressure, including a calibration load cell. Two versions of the calibration load cell are available. The original *two-piece* calibration load cell included both a load cell and a PIM-3 Digital Inline Amplifier; the *one-piece* calibration load cell does not require an external amplifier.

Before calibrating or verifying the pressure, clean the compactor and connect the load cell as described below:

- ✓ To remove any grease or asphalt, clean the ram head, turntable, and upper puck bearing surface with a degreasing cleaner.

CAUTION

Do not use a degreasing cleaner or glass cleaner to clean the clear chamber door. To prevent damage to the door surface, use a mild detergent only.

NOTE

For instructions on connecting the original *two-piece* calibration load cell, refer to the *Two-Piece Load Cell Connections* section on page A-6.

NOTE

When performing a pressure calibration on a compactor equipped with a 100-mm ram head, the black foam pad must be in place on the one-piece load cell to ensure an accurate calibration.

Connect the one-piece load cell as follows:

- ✓ Using the supplied serial cable, connect the load cell to the control unit's serial port.
- ✓ Connect the dc charger to the load cell, and plug the charger into an electrical outlet.

To begin pressure calibration or verification, press **⟨1⟩** at the **Select Calibration** or **Verify Calibration** screen. The control unit displays:

Connect Load Cell
Put On Lower Puck
Place In Chamber
Press ENTER

Place the lower puck in the center of the ram head. Place the calibration load cell on the puck. The load cell should be offset approximately 1/4-inch (6 mm) toward the rear of the chamber. This aligns the load cell with the ram shaft.

Route the load cell cable(s) through the gap above the chamber door. While closing the chamber door, place the cable(s) in the small notch at the top of the chamber door. Press **⟨ENTER⟩**. The compactor then measures the unloaded pressure on the load cell. During this measurement, the control unit displays:

Pressure Calibration
Testing Calibration
Load Cell
Please Wait

If the load cell is not properly connected, the control unit displays the following. Check the load cell connections and press **⟨ENTER⟩** to continue.

Pressure Calibration
Communication Error
Check Load Cell
Press ENTER

After measuring the unloaded pressure on the load cell, the control unit displays:

Place Upper Puck
On Top of Load Cell

Press ENTER

CAUTION

Use caution when opening and closing the chamber door to prevent catching or pinching the load cell cable(s).

Open the chamber door, center the upper puck on the load cell, and close the chamber door. Press **〈ENTER〉**.

CAUTION

When the ram raises the load cell and pucks, ensure that the upper puck falls completely within the circular upper puck-bearing surface. If not, re-position the load cell and pucks and repeat the calibration. Failure to align the pucks and load cell properly may result in an incorrect calibration.

During calibration and verification, the compactor raises the compaction ram and performs a series of pressure measurements at high and low pressure. During this process, the control unit displays the ram height and the status of the operation.

When complete, the control unit lowers the ram and displays the compaction pressure as measured internally by the compactor (*System*) and as measured by the load cell (*Calibration*):

Pressure Calibration
System: 600 KPa
Calibration: 600 KPa
Press ENTER

As noted earlier in this chapter, if the system was performing a calibration, the pressure calibration stored in the system memory is replaced by the measured value. If the system was verifying the pressure, the memory value is not changed.

If the *System* pressure differs from the *Calibration* pressure by more than 5 kPa, or if the *System* pressure is not within 600 ± 2 kPa, check all cable connections and the position of the load cell and pucks. Repeat the calibration or verification. If repeated attempts to calibrate or verify the pressure fail, contact your Troxler representative.

Press **〈ENTER〉**. The control unit returns to the **Select Calibration** or **Verify Calibration** display shown on pages 3–5 and 3–6. To change modes (*Calibrate* or *Verify*), press **〈ESC〉** to return to the **Select Mode** display shown on page 3–4.

Open the chamber door and remove the calibration load cell and pucks. Unplug the dc charger from the electrical outlet, and disconnect the load cell from the dc charger and control unit. (Or, if using the two-piece calibration load cell, disconnect the PIM–3 from the load cell, dc charger, and control unit.) Return all parts to the Performance Verification Kit case.

SPECIMEN HEIGHT

Always calibrate the specimen height after calibrating the pressure. If calibrating the height and pressure, calibrate the pressure first. Then, calibrate the specimen height.

NOTE

Before calibrating or verifying the specimen height, clean the ram head, turntable, and upper puck bearing surface with a degreasing cleaner. Failure to do so may cause the height calibration to be inaccurate.

CAUTION

Do not use a degreasing cleaner or glass cleaner to clean the clear chamber door. To prevent damage to the door surface, use a mild detergent only.

To begin height calibration or verification, press **⟨2⟩** at the **Select Calibration** or **Verify Calibration** screen. The control unit displays:

**Assemble Height Std
and papers between
pucks into Chamber.
Press ENTER**

Place a clean puck, with the small side down, in the center of the ram head. Place two specimen papers and the height standard on the puck. The height standard should be offset approximately 1/4 inch (6 mm) toward the rear of the chamber. This aligns the height standard with the ram shaft. Place a second puck small side up and centered on the height standard. Close the chamber door and press **⟨ENTER⟩**.

The control unit prompts the operator to enter the standard height:

**Height Calibration
Enter Std Height**

Press ENTER

The height of the height standard is stamped on its side. Enter the height to the nearest hundredth and press **(ENTER)**.

CAUTION

When the ram raises the height standard and pucks, ensure that the upper puck falls completely within the circular upper puck-bearing surface. If not, re-position the height standard and pucks, and repeat the calibration. Failure to align the pucks and height standard properly may result in an incorrect calibration.

The compactor raises the ram, height standard, and pucks to the upper puck-bearing surface, and then lowers the ram slightly. The compactor calculates the system pressures, and then raises the height standard and pucks to the upper puck-bearing surface. After raising the ram, the compactor calculates the spacer height. This entire operation takes approximately 75 seconds.

If the system was performing a calibration, the control unit displays the measured value and the standard height as entered by the operator. The difference should be less than 0.10 mm. The height calibration stored in the system memory is replaced by the measured value.

Height Calibration
Measured: xx.xxmm
Standard: xx.xxmm
Press ENTER

If the system was verifying the specimen height, the control unit displays only the measured value. The height calibration stored in memory is not changed.

Height Calibration
Measured: xx.xxmm
Press ENTER

Press **〈ENTER〉**. The compactor lowers the ram to the home position and the control unit returns to the **Select Calibration** or **Verify Calibration** display shown on pages 3–5 and 3–6. Open the chamber door and remove the height standard, pucks, and specimen papers.

To change modes (*Calibrate* or *Verify*), press **〈ESC〉** to return to the **Select Mode** display shown on page 3–4.

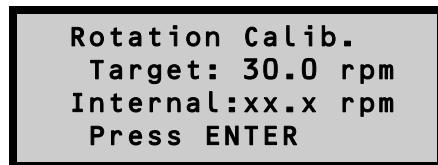
ROTATION SPEED

Under normal conditions, the Model 4141 does not require calibration of the rotation speed. Calibrate the rotation speed after replacing the dc motor, gearbox, or dc motor controller, or if the turntable appears to rotate at speeds other than 30 rpm.

To calibrate or verify the rotation speed, press **⟨3⟩** at the **Select Calibration** or **Verify Calibration** screen. The control unit displays:



The compactor performs a series of rotation speed checks, then displays the results:



As noted earlier in this chapter, if the system was performing a calibration, the rotation speed calibration stored in the system memory is replaced by the measured value. If the system was verifying the rotation speed, the memory value is not changed.

Press **⟨ENTER⟩**. The control unit returns to the **Select Calibration** or **Verify Calibration** display shown on pages 3–5 and 3–6.

To change modes (*Calibrate* or *Verify*), press **⟨ESC⟩** to return to the **Select Mode** display shown on page 3–4.

ANGLE OF GYRATION

NOTE

The angle of gyration on the Model 4141 Gyratory Compactor is calibrated and fixed at the factory. Operator calibration is not required.

Verification

The angle of gyration can be verified easily, as it is continuously monitored and displayed on the control unit during gyration. After each specimen is compacted, the angle versus gyration data may be printed or downloaded to a computer by pressing **(9)** from the *Setup* options (as described in the *Pressure/Angle* section on page 2-30).

NOTE

If the angle of gyration is less than 1.23° or greater than 1.27°, contact your Troxler representative.

Calibration

The factory angle calibration is monitored continuously by the Model 4141 using an electronic probe. This probe is NIST-traceable, and may be removed and sent to Troxler for calibration yearly. Contact your Troxler representative for instructions on returning the probe for calibration.

NOTE

The *Angle of Gyration* function on the **Select Calibration display is to be used only by qualified service personnel.**

CAUTION

The electronic probe used to monitor the factory angle calibration should be removed or installed only by trained service personnel.

The Model 4141 Gyratory Compactor should not be operated with any panels removed.

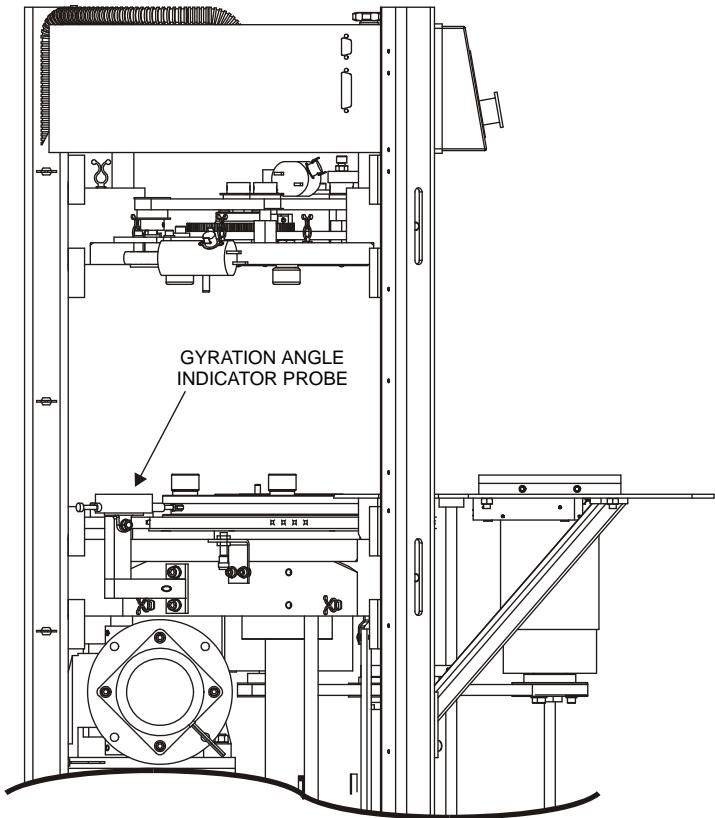
To remove the angle indicator probe:

- ✓ Turn the compactor power off, and unplug the unit from the 115 V ac outlet.
- ✓ Using a 3/4-inch wrench, remove the three hex head bolts from the top panel and remove the top panel.
- ✓ Using a Phillips screwdriver, remove the screws from the left and right rear panels, and remove the rear panels.

NOTE

Do not remove the screws holding the upper and lower front panels or the metal-colored chamber panel. These screws are visible through circular cutouts in the rear panels.

- ✓ Using Figure 3–1, locate the gyration angle indicator probe. Follow the probe cable to its mating connector near the back of the control unit, and disconnect the probe cable.
- ✓ Using a 7/16-inch wrench and a 3/16-inch Allen wrench, remove the gyration angle indicator probe from its support bracket.
- ✓ To re-assemble the probe, follow the disassembly steps in reverse.



RIGHT SIDE
(REAR PANELS REMOVED)

Figure 3–1. Location of Gyration Angle Indicator Probe

CHAPTER 4

COMPACTING A SPECIMEN

This chapter provides step-by-step instructions for creating an asphalt specimen using the Model 4141 Gyratory Compactor. This description includes information on preparing the hot-mix asphalt, compacting the specimen, and extruding the specimen from the mold. This chapter also includes directions for using the compactor's *Manual Control* functions.

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COMPACTING A SPECIMEN

WARNING

To prevent personal injury or equipment damage, before operating the Model 4141 Gyratory Compactor, the operator should become familiar with the safety warnings on page 1–2.

The following is a checklist for compacting an asphalt specimen with the Model 4141 Gyratory Compactor. Each step is discussed in detail in the following text.

- ✓ Set up the gyratory compactor.
- ✓ Clean the turntable, ram head, and upper puck bearing surface and lubricate the upper and lower rollers.
- ✓ Prepare the asphalt mixture and place it in the mold.
- ✓ Place the mold in the compactor chamber, and compact the specimen.
- ✓ Move the mold containing the compacted specimen from the compactor chamber to the extruder, and extrude the asphalt specimen from the mold.

SETTING UP

As described in Chapter 2, the Model 4141 may require some set up before compacting a specimen. Check the number of gyrations and/or minimum height. To automatically output gyration versus height data, connect the control unit to the computer or printer and turn on the *Auto Out* option.

CLEANING AND LUBRICATING

CAUTION

Failure to properly clean and lubricate the Model 4141 before each use may result in compaction errors, premature equipment wear, and other problems.

Before operating the compactor, and prior to each use:

- ✓ Clean the turntable, ram head, and upper puck bearing surface with a degreasing cleaner.

CAUTION

Do not use a degreasing cleaner *or* glass cleaner to clean the clear chamber door. To prevent damage to the door surface, use a mild detergent only.

- ✓ Lubricate the upper and lower rollers using Magnalube®-G.
- ✓ Lubricate the ram head using Magnalube®-G.

CAUTION

Failure to lubricate the ram head daily before use may cause excessive noise and could result in equipment damage.

PREPARING A SPECIMEN

Lay the mold on its side and slowly insert the lower puck, with the small face down, into the mold. **For the rest of the chapter, the mold with the puck inserted will be referred to as the *mold*.**

WARNING

Always wear heat-resistant gloves when handling any hot substance.

When moving the mold, firmly grasp it on either side under the upper flange.

Prepare the asphalt mixture. Place the asphalt mixture, the mold (containing the lower puck), and the upper puck into an oven. Heat the asphalt mixture, mold, and upper puck to the compaction temperature of the asphalt mixture.

CAUTION

Do not heat molds above 175 °C (350 °F). Heating above this temperature may warp the mold and create errors in the angle of gyration.

Remove the asphalt from the oven, and place it on a work surface. Remove the heated mold and upper puck from the oven. Place both items next to the hot-mix asphalt.

Place a specimen paper in the heated mold on top of the lower puck (see Figure 4–1). Load the hot asphalt mixture into the mold.

NOTE

To maintain the specimen temperature and prevent segregation of the specimen, the asphalt must be loaded into the mold in one continuous motion.

Place another specimen paper on top of the asphalt mix. Place the upper puck, with its large side down, into the mold. Keep the upper puck oriented horizontally while inserting it to prevent it from becoming wedged in the mold.

CAUTION

If the lower or upper puck becomes wedged in the mold, it must be removed and inserted correctly before compacting the asphalt specimen.

Wearing heat-resistant gloves and safety glasses, place the hot mold on the table of the compactor between the two guides. Rotate the mold so that the notch in the upper flange is toward the rear. Slide the mold into the compaction chamber. Rotate the mold as needed to ensure that the notch in the upper flange engages the locating pin on the upper plate of the compaction chamber. Close the chamber door.

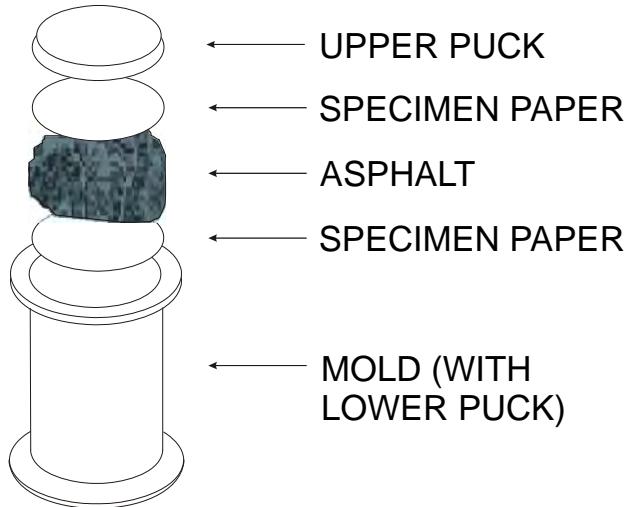


Figure 4–1. Loading the Mold

COMPACTING THE SPECIMEN

The Model 4141 Gyratory Compactor provides a fully automatic method of controlling compaction. In *Automatic* mode, the operator compacts the specimen with a single keystroke. The Model 4141 compacts the specimen based on the number of gyrations or the target specimen height specified by the operator. In *Automatic* mode, the operator can also automatically output compaction data.

The Model 4141 also provides a set of *Manual Control* functions, which enable the operator to exercise each phase of the compaction cycle.

NOTE

The *Manual Control* functions are intended for use only during maintenance or servicing of the compactor, or to recover from failures encountered in a compaction cycle while in *Automatic* mode. The *Manual Control* functions should not be used to compact asphalt.

Automatic Compaction

After placing the loaded mold into the compaction chamber and closing the chamber door, press **<START>**. The compactor first latches the top of the mold, and sets the angle of gyration.

If the mold notch is not properly aligned with the locating pin, the mold will not be latched completely. In this event, the compaction cycle will not continue, and the mold will be trapped in the chamber. The control unit momentarily displays the following:

Mold latch is not
properly engaged!
Function disabled!

The control unit then displays:

WARNING!!!
Ram is not fully
retracted into well
Press ENTER

Press **<ENTER>** to retract the ram fully and to release the mold.

If the mold latches correctly, the compactor raises the ram into position. The control unit displays the following:

RAISING RAM
Gyration #:
Ram Height: xxx.x mm
Out: Prn.

When the angle is set and the ram is in position, the Model 4141 begins compaction. During this process, the control unit displays the following, with the number of gyrations and ram height updated each gyration. If the *Auto Out* function is enabled, the compactor automatically outputs the gyration versus height data during compaction.

GYRATING
Gyration #: x
Ram Height: xxx.x mm
Out: Prn. Ang: 1.25

The compactor continues until the desired number of gyrations or target specimen height, as selected by the operator, is reached. The compactor then stops gyration, rotates the turntable to the home position, lowers the ram slightly, and unlatches the mold.

NOTE

The Model 4141 continuously monitors the compaction pressure during the compaction cycle. If the pressure is not within 600 ± 18 kPa, the compaction cycle stops and the compactor displays the error message Pressure is not within tolerance! To abort gyration press ENTER.

The compactor lowers the ram further to remove the gyration angle. The compactor then raises the ram to remove the angle from the asphalt specimen. During this process, the control unit displays:

REMOVING ANGLE
Gyration #: xx
Ram Height: xxx.x mm
Out: Prn. Ang: 1.25

The compactor then lowers the ram. The control unit displays:

LOWERING RAM
Gyration #: xx
Ram Height: xxx.x mm
Out: Prn. Ang: 1.25

When the ram is fully lowered, the compactor is ready to extrude the asphalt specimen.

If the ram does not lower fully, the control unit displays:

WARNING!!!
Ram is not fully
retracted into well
Press ENTER

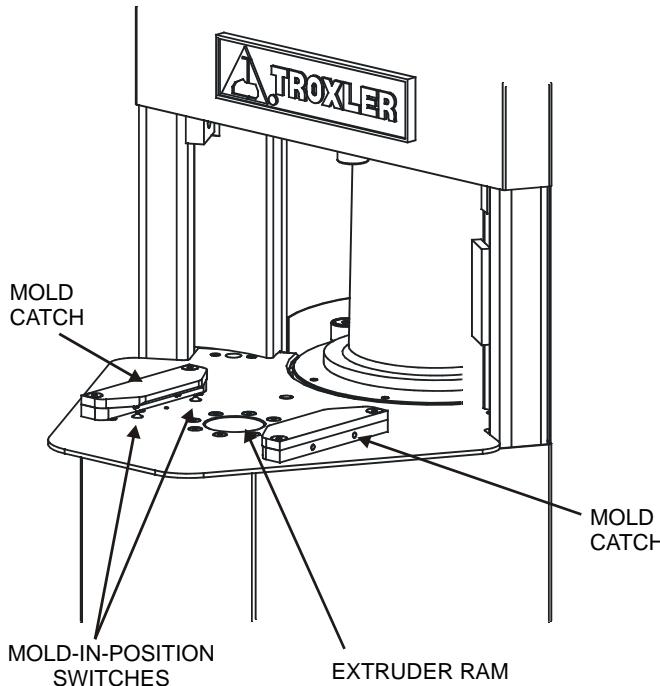
Open the chamber door and, **wearing heat-resistant gloves**, push and pull the bottom of the mold to free the ram. If the mold cannot be pulled from the compaction chamber, enter *Manual Control* mode, as described on page 4–12. Latch the mold, raise the ram for approximately 5 seconds, and then lower the ram. If the ram still does not retract fully, repeat this process.

EXTRUDING THE SPECIMEN

When the specimen has been compacted in *Automatic* mode and the ram has been fully lowered, the compactor is ready to extrude the specimen from the mold. The control unit displays:

To extrude sample
position mold and
press ENTER
ESC to Exit

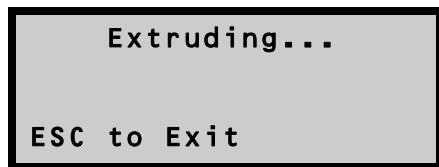
Open the chamber door and, **wearing heat-resistant gloves**, slide the mold forward from the compaction chamber to the extruder ram. Place the bottom flange of the mold in the extruder detent. When properly placed in the detent, the mold presses two switches under the left mold catch (see Figure 4-2). The switches make an audible *click* when pressed.



4. MAKING A SPECIMEN

Figure 4-2. Mold-in-Position Switches

Close the chamber door and press **ENTER** to begin extrusion. The control unit displays:



The extrusion process takes approximately 45 seconds. If the specimen does not begin to extrude from the top of the mold after approximately 30 seconds, reposition the mold **slightly** to ensure that both switches are pressed. The extruder should begin to operate.

NOTE

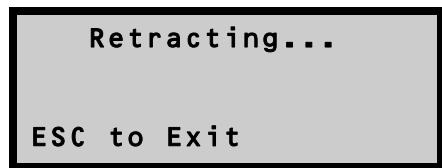
Because the extruder ram will not operate unless the mold is positioned properly, the operator may wish to practice positioning the mold in the extruder detent before compacting the next specimen.

When the specimen has been fully extruded from the top of the mold, the control unit displays:



Remove the upper puck from the top of the specimen and set aside. Lift the specimen from the mold, and remove the specimen papers from the top and bottom of the specimen.

Press **〈ENTER〉** to retract the extruder ram from the mold. The control unit displays:



Remove the mold from the tabletop when the compactor stops running. Clear any loose asphalt from the turntable, ram head, upper puck-bearing surface, and tabletop.

To prepare the compactor for the next compaction cycle, lubricate the upper and lower rollers using Magnalube-G.

After the last compaction cycle of the day, clean the turntable, ram head, upper and lower rollers, upper puck-bearing surface, and tabletop with a degreasing cleaner.

CAUTION

Do not use a degreasing cleaner or glass cleaner to clean the clear chamber door. To prevent damage to the door surface, use a mild detergent only.

MANUAL CONTROL

The *Manual Control* functions allow the operator to manually exercise each function of the compaction process. Using *Manual Control*, the operator can latch and release the mold, raise and lower the compactor and extruder rams, start and stop gyration, and move the mold and compactor rams to their home positions.

NOTE

The *Manual Control* functions are intended for use only during maintenance or servicing of the compactor, or to recover from failures encountered in a compaction cycle while in *Automatic* mode. The *Manual Control* functions should not be used to compact asphalt.

To access the *Manual Control* functions, press **〈SETUP〉**. The control unit displays:

```
Press # to Select ↑
1-Gyrate to # Gyr.
2-Gyrate to Height
3-Select Output
```

Press **〈6〉** to display the *Manual Control* functions. Use the arrow keys to scroll through the function displays shown below. These functions are described in the following sections.

```
Manual Control ↑
1-Latch Mold
2-Raise Ram
3-Start Rotation
```

```
Manual Control ↑
4-Lower Ram
5-Release Mold
6-Raise Extruder
```

Manual Control ↑
7-Lower Extruder
8-Rotate Home
9-Move Ram to Home

Manual Control ↑
.0-Retract Screws

LATCH MOLD

The first step in a compaction process is to latch the mold. To exercise this function, press **⟨1⟩**. The control unit displays:

LATCHING MOLD
Stop to Terminate
ESC to Exit

The compactor latches the mold and sets it at the gyration angle. When the mold is latched, the control unit returns to the **MANUAL CONTROL** display.

RAISE RAM

The next step in the compaction process is to raise the ram. To exercise this function manually, press **⟨2⟩**. The control unit displays:

RAISING RAM
Stop to Terminate
ESC to Exit

The compactor will raise the ram until it reaches the minimum height, or until it has applied the compaction pressure of 600 kPa. The control unit then returns to the **MANUAL CONTROL** display.

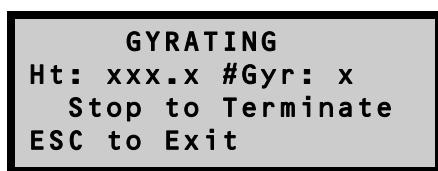
Note that the ram remains in the raised position until a specimen has been compacted as described in the following section, or until the operator manually lowers the ram by pressing **(4)**.

Note also that if the operator presses **(STOP)** while the ram is being raised, the ram will stop and will remain at its current height. The operator must then manually lower the ram by pressing **(4)**.

START ROTATION

Under *Manual Control*, as in *Automatic* mode, the operator selects whether the compactor rotates to a selected number of gyrations or until the specimen reaches a target height. Refer to Chapter 2 for instructions on setting the number of gyrations and target specimen height.

To exercise this function, press **(3)**. The control unit displays:



GYRATING
Ht: xxx.x #Gyr: x
Stop to Terminate
ESC to Exit

The compactor gyrates until it reaches the set number of gyrations or target specimen height. It then stops gyrating, rotates the mold to the home position, and displays the following message:



Remove pressure now?

This message provides a delay before removing the pressure from the ram. This delay can be used to allow a loose asphalt mix to cool sufficiently to prevent its falling apart.

When ready to remove the pressure, press **〈YES〉**. The compactor removes the gyration angle, lowers the ram, and releases the mold. The control unit then returns to the **MANUAL CONTROL** display.

Note that if the operator presses **〈STOP〉** during gyration, the compactor stops gyration and rotates the mold to its home position. The control unit then returns to the **MANUAL CONTROL** display.

LOWER RAM

If the compactor is stopped with the ram raised, the operator can manually lower the ram by pressing **〈4〉**. The control unit displays:



LOWER RAM
Ht: xxx.x
Stop to Terminate
ESC to Exit

When the ram is fully lowered into its well, the control unit returns to the **MANUAL CONTROL** display. If the ram does not lower completely, refer to page 4–8 for instructions on freeing and lowering the ram.

RELEASE MOLD

Similarly, if the compactor is stopped with the mold latched, the operator can manually release the mold by pressing **〈5〉**. The control unit displays:

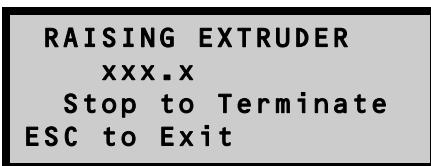


RELEASING MOLD
Stop to Terminate
ESC to Exit

When the mold is released, the control unit returns to the **MANUAL CONTROL** display.

RAISE EXTRUDER

To manually extrude a compacted specimen, open the chamber door and, **wearing heat-resistant gloves**, slide the mold forward from the compaction chamber to the extruder ram. Place the bottom flange of the mold in the extruder detent. When properly placed in the detent, the mold presses two switches under the left mold catch (see Figure 4–2). The switches make an audible *click* when pressed. Close the chamber door and press **⟨6⟩** to raise the extruder. The compactor raises the compaction ram to its home position. The control unit displays:



The compactor then raises the extruder ram. The control unit displays:



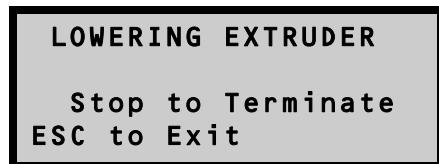
The extrusion process takes approximately 45 seconds. If the specimen does not begin to extrude from the top of the mold after approximately 30 seconds, reposition the mold **slightly** to ensure that both switches are pressed. The extruder should begin to operate.

When the specimen has been fully extruded from the top of the mold, the extruder ram remains in its fully raised position and the control unit returns to the **MANUAL CONTROL** display.

Remove the upper puck from the top of the specimen and set aside. Lift the specimen from the mold, and remove the specimen papers from the top and bottom of the specimen. Lower the extruder as described in the following section.

LOWER EXTRUDER

To lower the extruder, press **⟨7⟩**. The control unit first displays:



The control unit then displays:



When the extruder ram is fully lowered, the control unit returns to the **MANUAL CONTROL** display.

ROTATE HOME

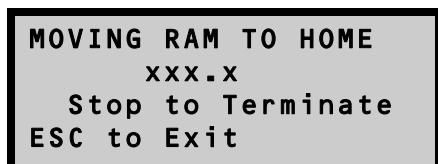
If the compactor is stopped with the mold not in the home (loading/unloading) position, the operator can manually rotate the mold home by pressing **⟨8⟩**. The control unit displays:



When the mold is in the home position, the control unit returns to the **MANUAL CONTROL** display.

MOVE RAM TO HOME

The operator can manually move the ram to its home position by pressing **⟨9⟩**. The control unit displays:



MOVING RAM TO HOME
xxx.x
Stop to Terminate
ESC to Exit

When the ram is in the home position, the control unit returns to the **MANUAL CONTROL** display.

RETRACT SCREWS

NOTE

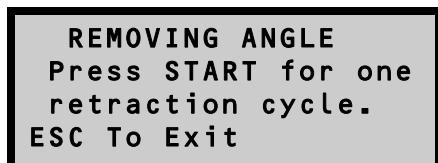
This function has been disabled on compactors produced during or after May 2001.

Compactors produced before May 2001 included zero-angle screws that were used to set the mold angle. If these zero-angle screws fail to retract, the operator can manually retract them by pressing **⟨.⟩⟨0⟩**. The control unit displays:



Press START for one
retraction cycle.
ESC To Exit

Press **⟨START⟩**. The control unit displays:



REMOVING ANGLE
Press START for one
retraction cycle.
ESC To Exit

When the screws are fully retracted, the control unit returns to the **MANUAL CONTROL** display.

If repeated attempts to retract the screws are unsuccessful, contact your Troxler representative.

APPENDIX A**TROUBLESHOOTING AND SERVICE**

This appendix contains information on servicing and maintaining the Model 4141 Gyratory Compactor.

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TROUBLESHOOTING

WARNING

To prevent personal injury or equipment damage, before operating the Model 4141 Gyratory Compactor, the operator should become familiar with the safety warnings on page 1-2.

GYRATORY COMPACTOR DOES NOT TURN ON

- ✓ Check that the power switch is in the *ON* position.
- ✓ Ensure that the unit is plugged in.
- ✓ Check the power to the wall outlet.
- ✓ Check that the fuse for the wall outlet is not blown or that the circuit breaker is not tripped.
- ✓ Check the control unit fuses, which are located inside the power switch assembly. Disconnect the power cord from the compactor and use a small flat-bladed screwdriver to open the cover of the power switch assembly. Pull out the red fuse assembly and check the fuses.

MOVING PARTS ARE NOT MOVING

- ✓ Check that all shrouds are in place.
- ✓ Ensure the unit is turned on.
- ✓ A switch may be broken. Check the shroud and emergency switches.

CONTROL UNIT DISPLAYS: **Interlock Error**

- ✓ Check that the top panel is properly mounted and secured.
- ✓ Check that the chamber door is closed.
- ✓ The emergency stop feature is active. To deactivate, rotate the **EMERGENCY** button clockwise. The control unit returns to the **MACHINE IDLE** screen.

DATA DOES NOT PRINT AUTOMATICALLY DURING COMPACTION

- ✓ For printing gyrations vs. height data, ensure that the *Auto Out* feature is enabled (see page 2–19).
- ✓ If printing gyrations vs. height data, check that the printer port is specified for the *Auto Out* feature (see page 2–19).

HEIGHT VS. # OF GYRATIONS DATA DOES NOT DOWNLOAD TO THE COMPUTER

- ✓ Check that the *Auto Out* feature is enabled (see page 2–19).
- ✓ Check that the serial port is specified for the *Auto Out* feature (see page 2–19).

HEIGHT VS. # OF GYRATIONS DATA DOES NOT PRINT

- ✓ Ensure the *Auto Out* feature is enabled (see page 2–19).

TURNTABLE DOES NOT APPEAR TO ROTATE AT 30 RPM

- ✓ Calibrate the rotation speed (see page 3–13).
- ✓ Call your Troxler representative.

GENERAL CALIBRATION PROBLEMS

- ✓ Check all cable connections.
- ✓ For the height calibration, ensure that the puck, specimen papers, and height standard are located properly on the ram head. The height standard should be placed near the center of the ram head, and offset approximately 1/4-inch (6 mm) toward the rear of the chamber.
- ✓ For the pressure calibration, ensure that the load cell and pucks are located properly on the ram head. The load cell should be placed near the center of the ram head, and offset approximately 1/4-inch (6 mm) toward the rear of the chamber.
- ✓ Repeat the calibration once. If you still have problems with the calibration, call your Troxler representative.

CONTROL UNIT DISPLAYS: Pressure Calibration Communication Error

- ✓ Check all connections between the control unit, PIM-3, and the external load cell (especially check between the PIM-3 and the load cell).
- ✓ Check the power connection.

ALL OTHER CONTROL UNIT ERROR MESSAGES

- ✓ Record the error message.
- ✓ Call the factory for further information (919) 549-8661.

GENERAL MAINTENANCE

The following sections provide general service information for the Model 4141, instructions for connecting the original two-piece calibration load cell, as well as a recommended schedule for performing regular maintenance on the unit.

SERVICE INFORMATION

WARNING

**To prevent personal injury or equipment damage,
unplug the gyratory compactor before attempting to
service the unit.**

The Model 4141 records the total number of hours of operation, and the hours since its last service. To review the service hours, press **〈SETUP〉**, then press **〈8〉** to access the *Review Constants* feature. The control unit displays the following:

```
Review Constants ↑
1-%Gmm Reference
2-Pressure Calib.
3-Rotation Calib.
```

Press **〈7〉**. The control unit displays the following:

```
Total hours = xxxx
Hours since last
Serviced = xxxx
Want to Change?
```

To exit without changing the service hours, press **〈NO/CE〉**. The control unit returns to the **MACHINE IDLE** display.

TWO-PIECE LOAD CELL CONNECTIONS

The Pressure Verification Kit includes all the equipment needed to calibrate and/or verify the compaction pressure, including a calibration load cell. Two versions of the calibration load cell are available. The original *two-piece* calibration load cell included both a load cell and a PIM-3 Digital Inline Amplifier.

NOTE

The current one-piece load cell is described on page 3–6.

If using the two-piece calibration load cell, connect the PIM-3 and load cell as follows (see Figure A–1):

- ✓ Using the supplied serial cable, connect the PIM-3 to the control unit's serial port.
- ✓ Using the load cell cable, connect the load cell to the PIM-3.
- ✓ Connect the dc charger to the PIM-3, and plug the charger into an electrical outlet.

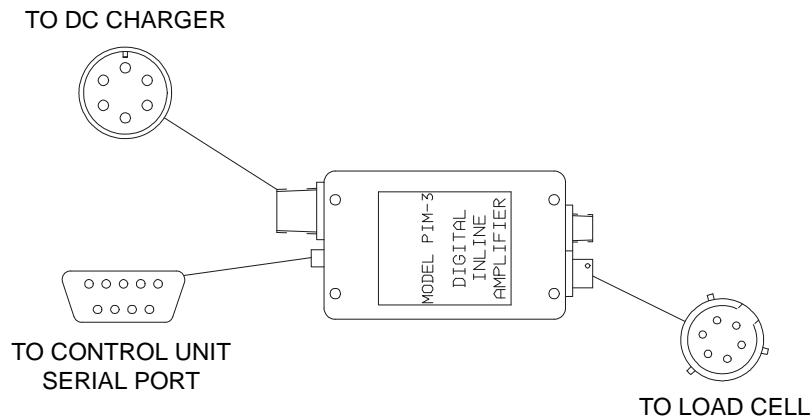


Figure A–1. Load Cell and PIM-3 Connections

SCHEDULE OF MAINTENANCE

CAUTION

Do not use a degreasing cleaner *or* glass cleaner to clean the clear chamber door. To prevent damage to the door surface, use a mild detergent only.

NOTE

Use any degreasing cleaner and a clean rag to clean metal parts. See the safety warnings on page 1-2.

For printer maintenance, see the printer *Operating Instructions*.

Before Each Cycle

- ✓ Clean the tabletop, turntable, ram head, and upper puck-bearing surface with a degreasing cleaner.
- ✓ Apply a coat of Magnalube®-G to the upper and lower rollers.

Daily

- ✓ Clean the mold, pucks, ram head, upper puck-bearing surface, and upper and lower rollers with a degreasing cleaner.
- ✓ Clean the recesses for the ram head and extruder ram using compressed air or vacuum.
- ✓ Apply a light coat of Magnalube-G to the upper and lower rollers.

Each Time the Compactor is Moved

On compactors produced before September 2001, the unit casters were equipped with brakes. After one of these units has been moved, test the brakes. If a caster is able to roll with the brake applied, adjust the brake as follows:

- ✓ With the brake in the off (horizontal) position, tighten the nut until the caster drags.
- ✓ Loosen the nut 1/4 turn at a time until the caster rotates freely.
- ✓ Repeat the above steps for the other two casters as needed, then retest the brakes.

CAUTION

If a caster brake cannot be adjusted, do not use the caster. Contact your Troxler representative for a replacement.

Every 80 Hours of Operation

- ✓ Vacuum the entire tabletop and turntable areas.
- ✓ Wipe or scrape away any asphalt residue that has adhered to the recesses for the ram head and extruder ram or to the bottom side of the ram head.
- ✓ After cleaning the tabletop and turntable, wipe the areas with a clean, dry cloth.
- ✓ Check the following for excessive wear (damage beyond the point of operation) or damage:
 - ◆ Turntable cover plate – Ensure that the surface is reasonably flat. Check for deep gouges. Replace if nearly worn through.
 - ◆ Rollers – Polishing on the surface is fine. Check for deep grooves, cocking, or bending. Rotate the rollers. If they are grooved, cocked, or bent, or will not rotate, call your Troxler representative;
 - ◆ Upper puck bearing surface (stainless steel disk) – Check for excessive gouging and embedded asphalt mix. Replace if embedded material protrudes from surface.

- ◆ Ram head – Ensure that the surface is reasonably flat. Check for pitting or chipping. Replace if necessary.
- ◆ Engagement pin – Check that the pin properly engages the notch in the mold. If not, call your Troxler representative.
- ◆ Mold – Check for pitting or chipping. Check upper and lower flanges for wear (flat area wider than 0.2 inches). Replace if necessary.
- ◆ Retaining ring (inside the bottom of the mold) – Ensure that the ring is in place. If necessary, return the mold to Troxler for servicing.
- ◆ Pucks – Ensure that the surfaces are reasonably flat. Check for pitting or chipping. Replace if necessary.

CAUTION

The dc motor chain tension should be checked or adjusted only by trained service personnel.

The Model 4141 Gyratory Compactor should not be operated with any panels removed.

- ✓ After the first 80 hours check the tension on the dc motor chain located inside the rear panels. (After the initial tension check, check the tension every 960 hours.) Move the chain from side to side. If the total horizontal displacement is greater than 1/2 inch, tighten the chain. To tighten the chain:
 - ✓ Using a 5/16-inch Allen wrench and 9/16-inch box-end wrench, loosen the four bolts connecting the gearbox (which has the chain around it) to the unit.
 - ✓ Move the gearbox to adjust the chain tension.
 - ✓ With the tension adjusted, tighten the four bolts using a 5/16-inch Allen wrench and 9/16-inch box-end wrench.
 - ✓ Move the chain from side to side. If the horizontal displacement is greater than 1/2 inch (6 mm), repeat the tightening procedure.

Every 500 Hours of Operation or Once a Year

CAUTION

The ram should be greased only by trained service personnel.

The Model 4141 Gyratory Compactor should not be operated with any panels removed.

- ✓ Add grease to the ram as follows:
 - ✓ Remove the rear panels, and apply a thin film of Magnalube-G to the load shaft.
 - ✓ Reinstall the rear panels and, using the *Manual Control* functions, raise the ram until the height on the control unit display is between 50 and 60 mm. Open the chamber door and apply a thin film of Magnalube-G to the load shaft.
 - ✓ Close the chamber door, and lower the ram.

CAUTION

The oil in the rotation gearbox should be changed only by trained service personnel.

The Model 4141 Gyratory Compactor should not be operated with any panels removed.

- ✓ After the first 500 hours, change the initial oil in the rotation gearbox attached to the dc motor chain. After the initial change, change the oil every 2500 hours.

Every 1000 Hours of Operation

CAUTION

The dc motor chain tension should be checked or adjusted only by trained service personnel.

The Model 4141 Gyratory Compactor should not be operated with any panels removed.

- ✓ Check the tension on the dc motor chain located inside the rear panels. Move the chain from side to side. If the total horizontal displacement is greater than 1/2 inch, tighten the chain. To tighten the chain:
 - ✓ Using a 5/16-inch Allen wrench and 9/16-inch box-end wrench, loosen the four bolts connecting the gearbox (which has the chain around it) to the unit.
 - ✓ Move the gearbox to adjust the chain tension.
 - ✓ With the tension adjusted, tighten the four bolts using a 5/16-inch Allen wrench and 9/16-inch box-end wrench.
 - ✓ Move the chain from side to side. If the horizontal displacement is greater than 1/2 inch, repeat the tightening procedure.

Every 2500 Hours of Operation

CAUTION

The oil in the rotation gearbox should be changed only by trained service personnel.

The Model 4141 Gyratory Compactor should not be operated with any panels removed.

- ✓ Change the oil in the rotation gearbox.

REPLACING PARTS

The following sections provide instruction for replacing a caster, the lower rollers, the cover plate, and the upper puck bearing plate on the Model 4141 Gyratory Compactor.

REPLACING THE LOWER ROLLERS

To replace the lower rollers (see Figure A-2):

- ✓ Using a 1/4-inch Allen wrench, remove the old rollers.
- ✓ Replace the rollers and tighten each one securely.

REPLACING THE COVER PLATE

To replace the cover plate (see Figure A-2):

- ✓ Carefully remove the six 4-40 × 3/8 socket head screws that secure the old cover plate and remove the cover plate.
- ✓ Install the new cover plate and secure with the six socket head screws.

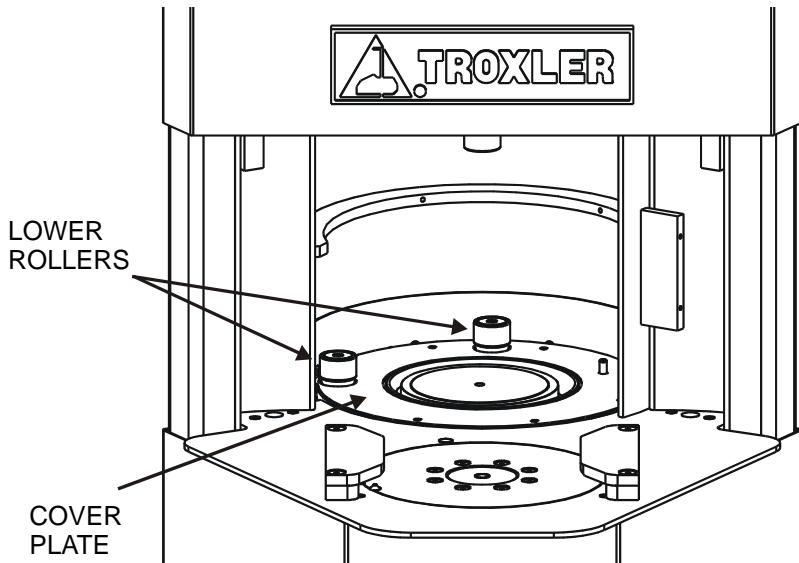


Figure A-2. Lower Rollers and Cover Plate

REPLACING THE UPPER PUCK BEARING PLATE

To replace the upper puck bearing plate (see Figure A-3):

- ✓ Remove the six 4-40 × 3/8 socket head screws that secure the bearing plate retainer ring.
- ✓ Remove the retainer ring and the upper puck bearing plate.
- ✓ Install the new bearing plate in the retaining ring with the smaller diameter surface facing down.
- ✓ Install the retaining ring and secure with the six socket head screws.

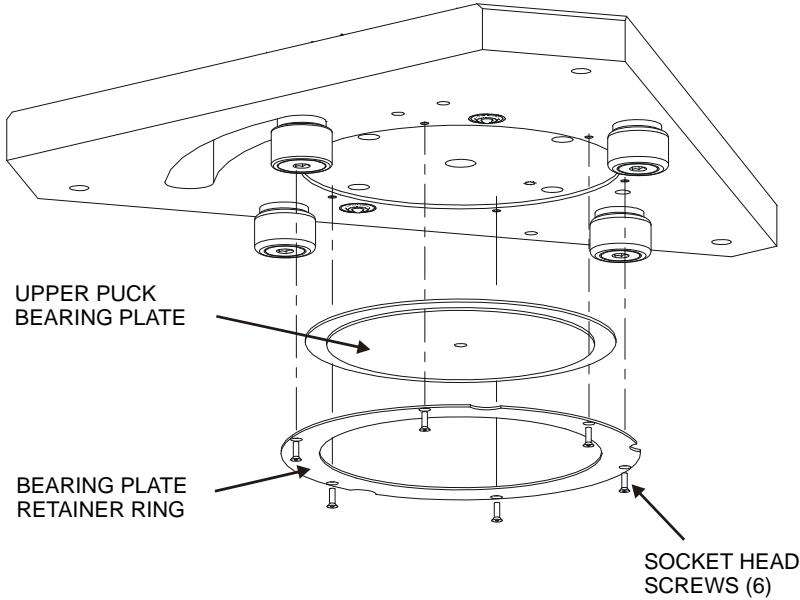


Figure A-3. Upper Puck Bearing Plate Replacement

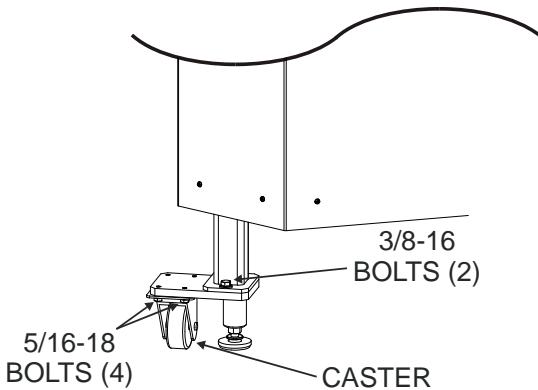
REPLACING A CASTER

Troxler has used two different types of casters on the Model 4141 Gyratory Compactor. The following sections provide instructions for replacing these two types of casters.

Units Produced in September 2001 or After

Starting in September 2001, compactors were equipped with the caster/foot assemblies shown in Figure A-4. To replace either the caster/foot assembly or the caster only:

- ✓ Using a 3/4-inch wrench, remove the three hex-head bolts from the top panel of the compactor and install the three 1/2-13 eyebolts included with the compactor accessories.
- ✓ Attach the center point of a sling or chain to the eyebolt at the rear corner of the compactor. Attach one end of the sling or chain to each of the other corners.
- ✓ Position the forklift or hoist over the center of the compactor and attach the two side lengths of the sling or chain to the forklift or hoist.
- ✓ Carefully lift the compactor, ensuring that it remains relatively level.
- ✓ Replace the caster/foot assembly or caster as follows:
 - ▶ If replacing the caster/foot assembly, use a 9/16-inch wrench to remove the two 3/8-16 bolts that secure the caster/foot assembly to the compactor frame. Install the new caster/foot assembly using the two 3/8-16 bolts.
 - ▶ If replacing the caster only, use a 1/2-inch wrench to remove the four 5/16-18 bolts that secure the caster to its mounting bracket. Install the new caster on the bracket and secure using the four 5/16-18 bolts.



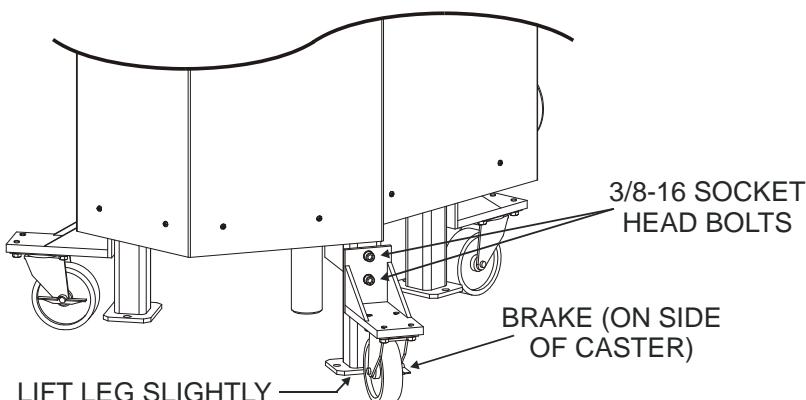
*Figure A-4. Caster/Foot Assembly, Units
Produced in September 2001 or Later*

- ✓ Gently lower the compactor to the floor.
- ✓ Remove the eyebolts from the top panel and replace the hex-head bolts.

Units Produced Before September 2001

On compactors produced before September 2001, the casters were equipped with brakes as shown in Figure A-5. To replace this type of caster:

- ✓ Set the brake on each caster.
- ✓ Place a pry bar under the compactor leg and lift slightly to remove the weight from the caster. As an alternative, carefully push against the compactor frame near the top of the unit to tip the compactor to one side.
- ✓ Slide a 1- to 1-1/2-inch spacer under the compactor leg and lower the leg onto the spacer. (The plywood spacers used to support the compactor legs during shipping can be used for this purpose.)
- ✓ Remove the two 3/8-16 socket head bolts that secure the caster bracket to the compactor leg.
- ✓ Using a 1/2-inch wrench, remove the four 5/16-18 bolts that secure the caster to the bracket.
- ✓ Install the new caster on the bracket and secure using the four 5/16-18 bolts.
- ✓ Reattach the bracket and remove the spacer.



*Figure A-5. Caster with Brake, Units
Produced Before September 2001*

REPLACEMENT PARTS

PART #	DESCRIPTION
106958	Printer, data
109865	Caster/foot assembly (units produced in September 2001 and later)
012912	Caster
012911	Caster, with brake (units produced before September 2001)
108109	Lower roller
108148	Bearing plate, upper puck
108149	Retainer, bearing plate
108093	Cover plate, gyratory
000206.1191	Screw, 4-40 × 3/8 flat socket head, stainless steel

ACCESSORIES

PART #	DESCRIPTION
012786	Lubricant, Magnalube-G (1-lb can)
018290	Lubricant brush
106989	Height standard assembly
107026	Cable, parallel printer, 6-ft
106514	Cable, serial, 8-ft
108687	<i>Model 4141 Manual of Operation and Instruction</i>
107406.1000	GyroPave for Windows XP, CD-ROM
108543	<i>GyroPave for Windows XP Manual of Operation and Instruction</i>
001014.2495	Eyebolt, 1/2-13
000085.2100	Hex nut, 1/2-13
108664	Power cord
106953	Specimen paper, 150 mm (1 package)

OPTIONAL ACCESSORIES

PART #	DESCRIPTION
108037.1000	Mold assembly, 150 mm with packaging
108477.1000	Mold assembly, 100 mm with packaging
107535	<i>Model 4141 100-mm Mold Conversion Kit</i>
108706	Pressure Verification Kit

RETURNING PARTS FOR SERVICE

Items returned for service must be accompanied by an RGA (Returned Goods Authorization) number, and a description of the instrument and its problem. This information is used by Troxler shipping and service personnel to expedite the repair work.

To obtain an RGA number, please call or fax Troxler headquarters at Research Triangle Park, or one of the branch offices with your request.

Please have the following information available when requesting an RGA number:

- ◆ Unit (or part) model and serial number.
- ◆ Part number/serial number (if applicable).
- ◆ Is the unit (part) still under warranty?
- ◆ Problem or difficulty you are having with the unit.
- ◆ Shipment method to Troxler and for return shipment.
- ◆ Shipping and billing address (not P.O. Box) – street address and zip.
- ◆ Phone number/contact (for questions from Troxler).
- ◆ Will estimate be required prior to performing any work on the part?
- ◆ Payment method: credit card, account number, or purchase order number. **All government agencies (city, county, state, and federal) must send purchase order numbers.**

NOTE

To prevent order duplication, if an order has been placed by telephone, please write “Confirming Order” on any follow-up written requests.

APPENDIX B

SPECIFICATIONS

This appendix provides environmental conditions and specifications for the Model 4141 Gyratory Compactor.

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Electrical Specifications	B-3
Mechanical Specifications	B-4

ENVIRONMENTAL CONDITIONS

Ambient Storage Temperature –55 to 85 °C
–67 to 185 °F)

NOTE

The Model 4141 Gyratory Compactor is UL listed to the following conditions.

Ambient Operating Temperature	10 to 50 °C (50 to 122 °F)
Altitude Rating	2000 meters maximum
Main Supply Voltage Fluctuation	±10%
Pollution Degree	2
Installation Categories (Overvoltage Categories)	II
Humidity	92% maximum

ELECTRICAL SPECIFICATIONS

Power Requirements 115 V ac, 50/60 Hz, single phase, 10 A

Fuse 6.3 A, 250 V ac, 5 × 20 mm time delay or
1/4 × 1-1/4-inch time delay

Serial Port:

Connector 9-pin male D-subminiature connector
RS-232 standard

Data format 8 data bits, 1 stop bit, no parity

Baud rate 9600

Cable type RS-232 null modem

9-pin female – 9 (25) pin female

Printer Port:

Connector 25-pin female D-subminiature

Cable type Standard parallel printer cable

Printer Specifications See printer *Operating Instructions*

MECHANICAL SPECIFICATIONS

Size	86W × 97D × 146H cm 34W × 38D × 57.5H in
Weight	265 kg (585 lb)
Shipping Weight, Unit with Packaging	302 kg (665 lb)
Shipping Weight, with All Accessories*	374 kg (825 lb)
Mold Weight	10.2 kg (22.4 lb)
Puck Weight	2.4 kg (5.3 lb)
Compaction Pressure	600 kPa (87 psi)
Pressure Accuracy	Meets or exceeds FHWA specifications
Number of Gyrations	1 — 300
Angle of Gyration	1.25 ± 0.02 degrees (fixed)
Rotation Speed	30 ± 0.5 rpm
DC Motor	3/4 hp
DC Motor Nominal Speed	1800 rpm
Maximum Mold Temperature	175 °C (350 °F)
Printer	See printer <i>Operating Instructions</i>

* Accessories include three (3) molds, printer, and Pressure Verification Kit.

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%Gmm

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MODEL 4141

GYRATORY COMPACTOR

U.S.A. Patent No. 5,939,642

Serial No. Year



UL[®]
C
US
LISTED
ASPHALT COMPACTOR
55BF

Troxler Electronic Laboratories Inc.
3008 Cornwallis Rd., P.O. Box 12057
Research Triangle Park, N.C. 27709, U.S.A.

115 VAC
10.0 VA
50/60 Hz

LABEL & WARRANTY

TROXLER ELECTRONIC LABORATORIES, INC.

LIMITED WARRANTY

TROXLER ELECTRONIC LABORATORIES, INC., and subsidiary, TROXLER INTERNATIONAL, LTD., hereinafter referred to as "TROXLER," warrants this instrument, Model 4141, Serial Number _____, against defects in material and workmanship for a period of six (6) months from date of shipment. For products sold through authorized TROXLER representatives, the date of shipment will be as of the transfer from representative to purchaser. During the applicable warranty period, TROXLER's obligation under this warranty shall be limited exclusively to the repair at a TROXLER facility at no charge, except for shipping to and from TROXLER'S plant, of any instrument which may prove defective under normal use and which TROXLER's examination shall disclose to its satisfaction to be thus defective. Normal use is defined for the purpose of this warranty as operation under normal load, usage, and conditions with proper care and maintenance and competent supervision. In no event shall TROXLER be held liable for damages, delays, or losses consequential, incidental, or otherwise attributable to the failure of this instrument. TROXLER's liability being specifically limited to repair as stated hereinabove. This warranty is automatically initiated except where modified by contractual or other written and signed agreement.

THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF, AND THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, AND TROXLER NEITHER ASSUMES, NOR AUTHORIZES ANYONE TO ASSUME FOR IT ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF THE INSTRUMENT. THIS WARRANTY SHALL NOT APPLY TO THE INSTRUMENT OR ANY PART THEREOF, WHICH HAS BEEN SUBJECTED TO DAMAGE BY ACCIDENT, NEGLIGENCE, ALTERATION, ABUSE, MISUSE, OR SERVICE NOT AUTHORIZED IN WRITING BY TROXLER. SUCH DAMAGE TO INCLUDE BUT NOT BE LIMITED TO BURNING OF CIRCUIT BOARDS AND HARNESS FROM IMPROPER SOLDERING TECHNIQUES AND DAMAGE TO THE INSTRUMENT DUE TO PURCHASER'S FAILURE TO PERFORM MAINTENANCE AS OUTLINED IN THE AUTHORIZED OPERATOR'S MANUAL. DUE TO THE NATURE OF THEIR USE, MECHANICAL ACCESSORY PARTS AND BATTERIES ARE WARRANTED FOR 90 DAYS ONLY FROM DATE OF SHIPMENT.

TROXLER ELECTRONIC LABORATORIES, INC.

Troxler International, Ltd.
Troxler Electronics (Canada), Ltd.
3008 Cornwallis Road
Post Office Box 12057
Research Triangle Park, NC 27709 USA

NOTICE TO CONSUMERS

Any disclaimer or limitation on the remedies expressed above shall not be effective to the extent prohibited by state or federal law.

NOTE: THIS WARRANTY EXCLUDES DAMAGE INCURRED IN SHIPMENT. IF THIS INSTRUMENT IS RECEIVED IN DAMAGED CONDITION, THE CARRIER SHOULD BE CONTACTED IMMEDIATELY. ALL CLAIMS FOR DAMAGE IN TRANSIT SHOULD BE FILED WITH THE CARRIER. IF REQUESTED, TROXLER WILL AID IN FILING OF CLAIMS AND/OR LOCATING PRODUCTS LOST IN TRANSIT.